382/260
Print Fig 1A

EL388608922US

BASIC ELEMENTS OF SYSTEM FOR ANALYSIS OF VARIABLES

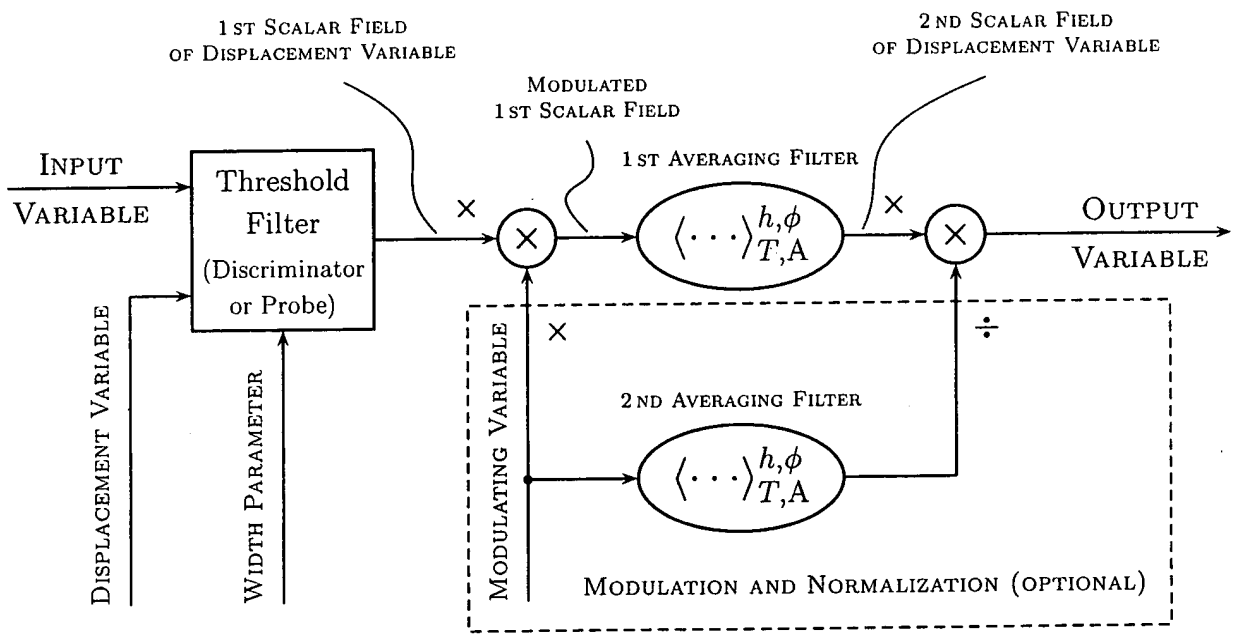



Fig. 1a

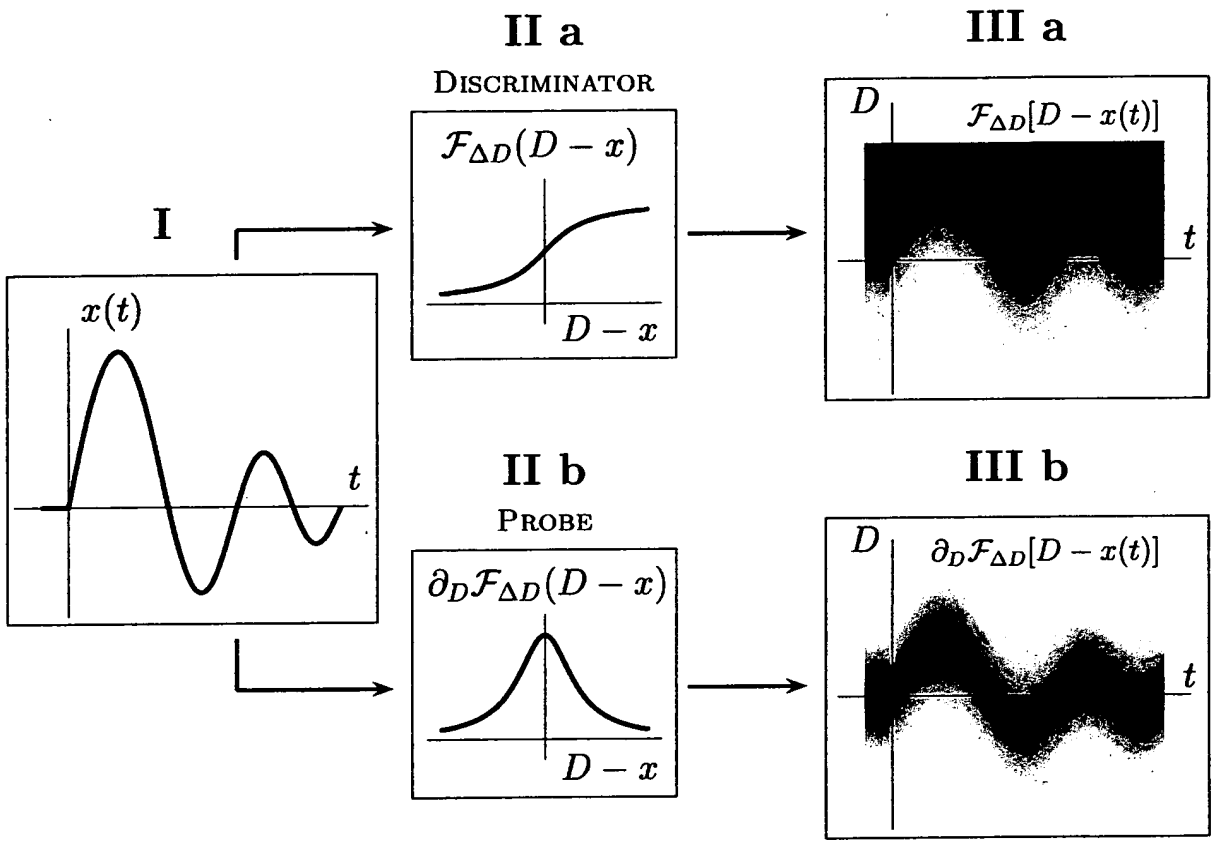

II a
DISCRIMINATOR
III a
I
$\mathcal{F}_{\Delta D}(D-x)$
$\mathcal{F}_{\Delta D}[D-x(t)]$
$x(t)$
$D-x$
$D$
$t$
II b
PROBE
III b
$\partial_D\mathcal{F}_{\Delta D}(D-x)$
$\partial_D\mathcal{F}_{\Delta D}[D-x(t)]$

Fig. 1b

Express Mail Label No. EL388608922US

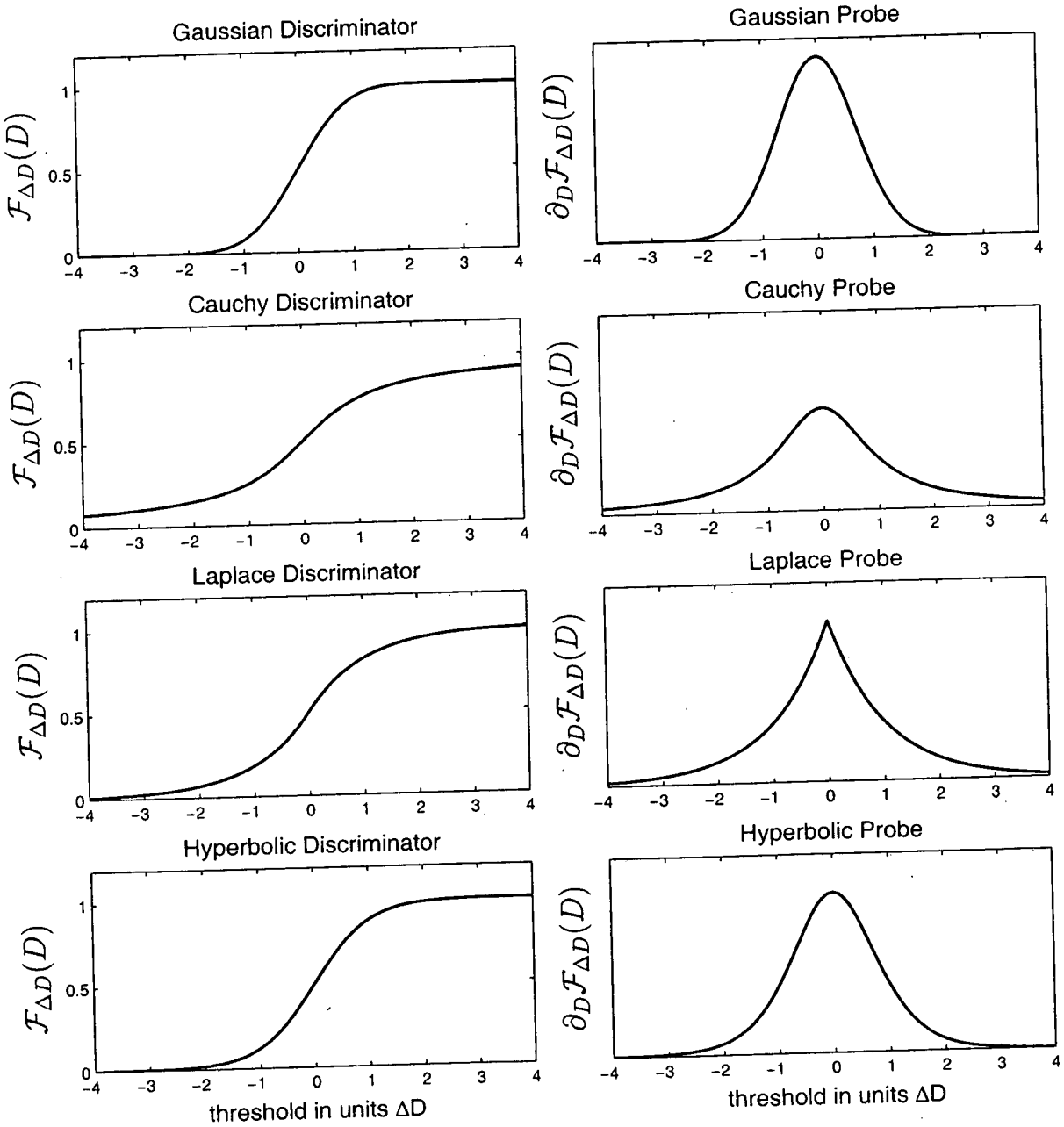



Fig. 2

D0825454.080804

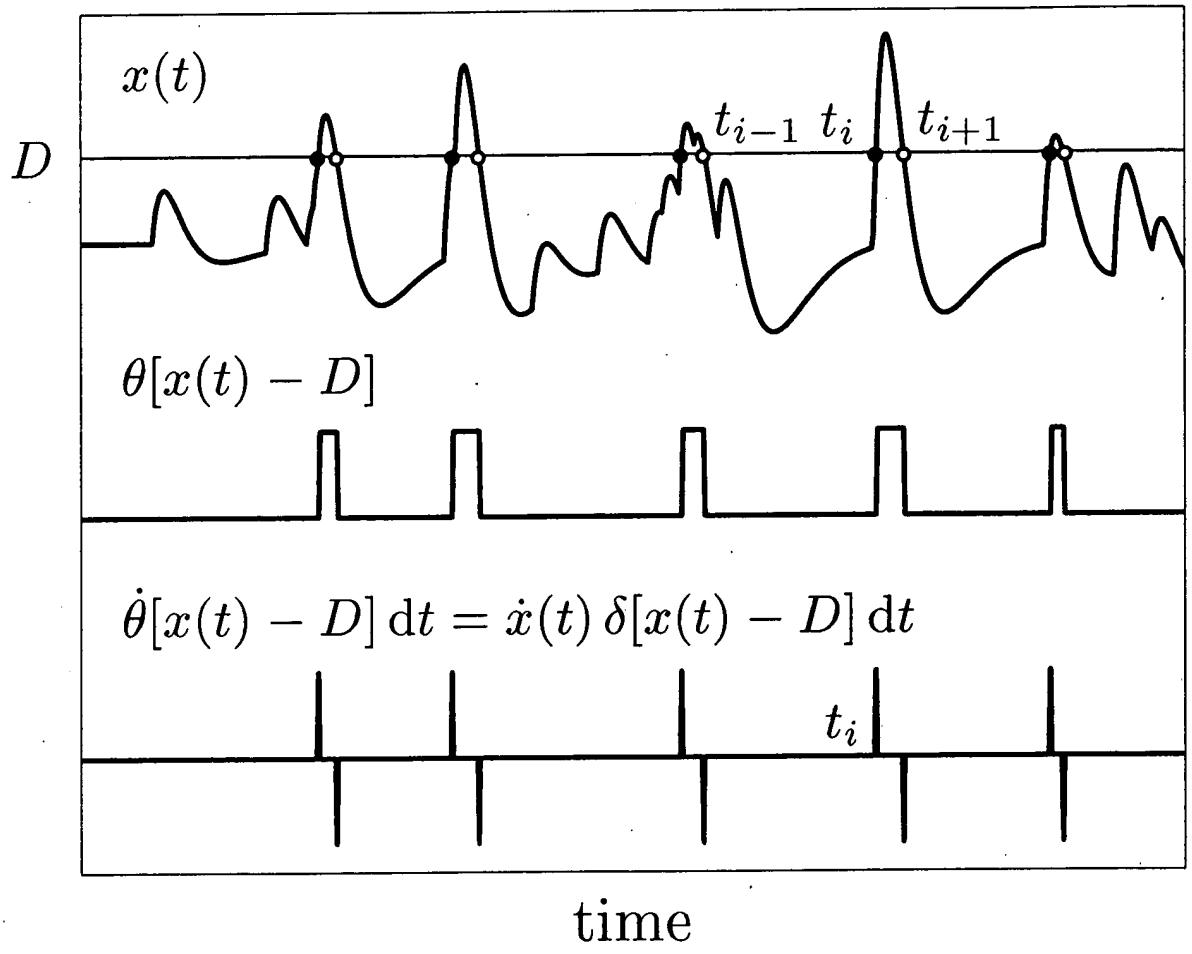



Fig. 3

DOCUMENT - 0000000

$$\Delta t_{ij} = \begin{cases} t_{i+1} - t_i & \text{if box } s_{ij} \text{ covers signal} \\ 0 & \text{otherwise} \end{cases}$$

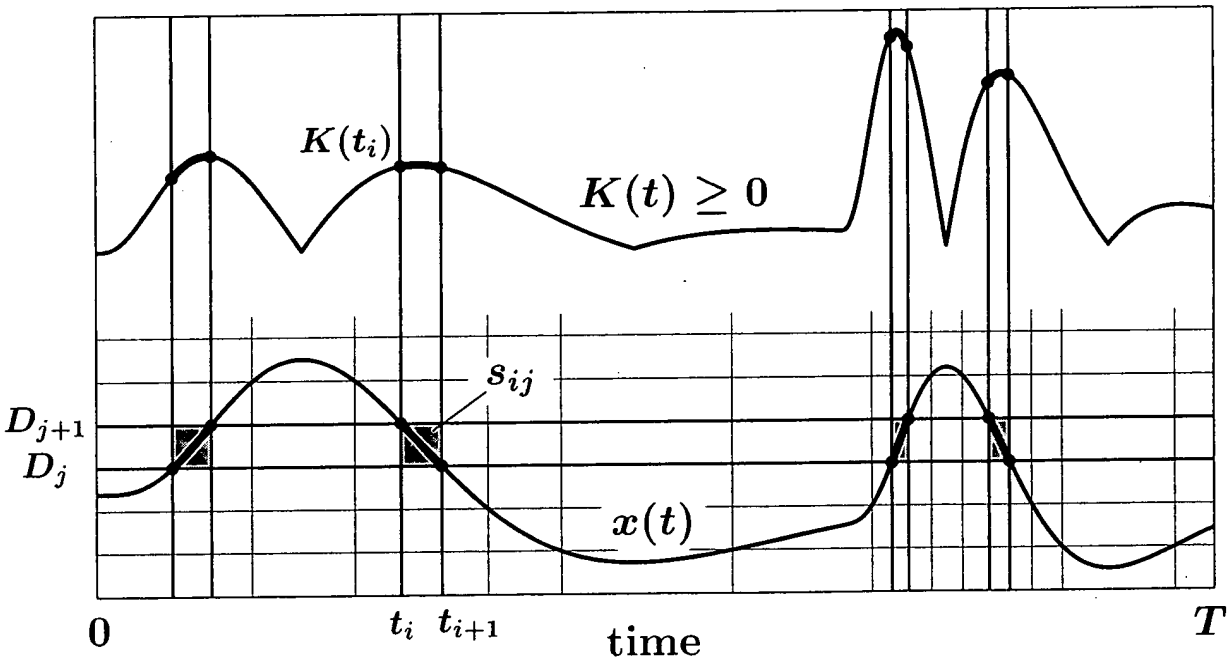



Fig. 4

Express Mail Label No. EL388608922US

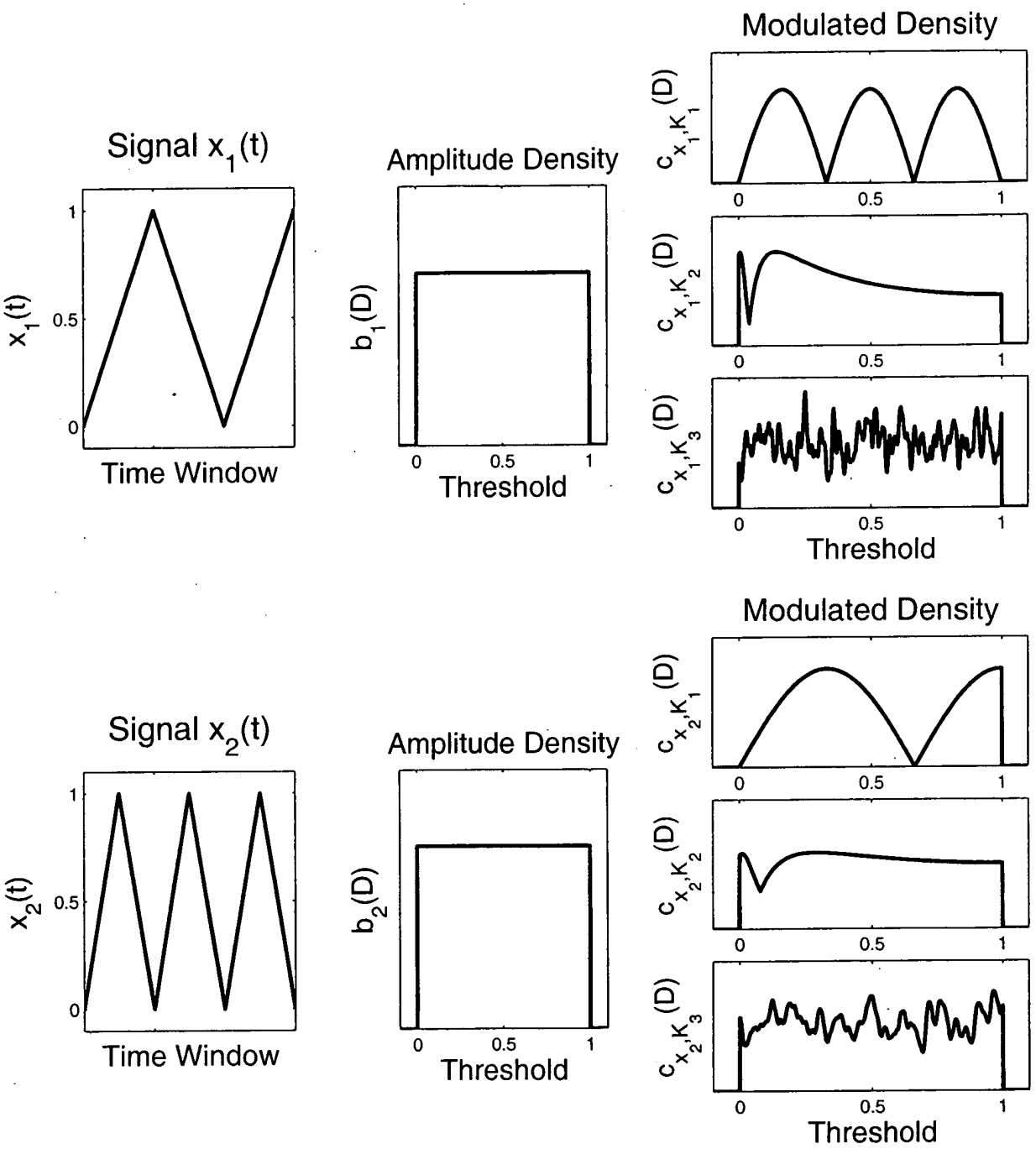



Fig. 5

Doc. #: 15252.2 Date: 10/30/2003

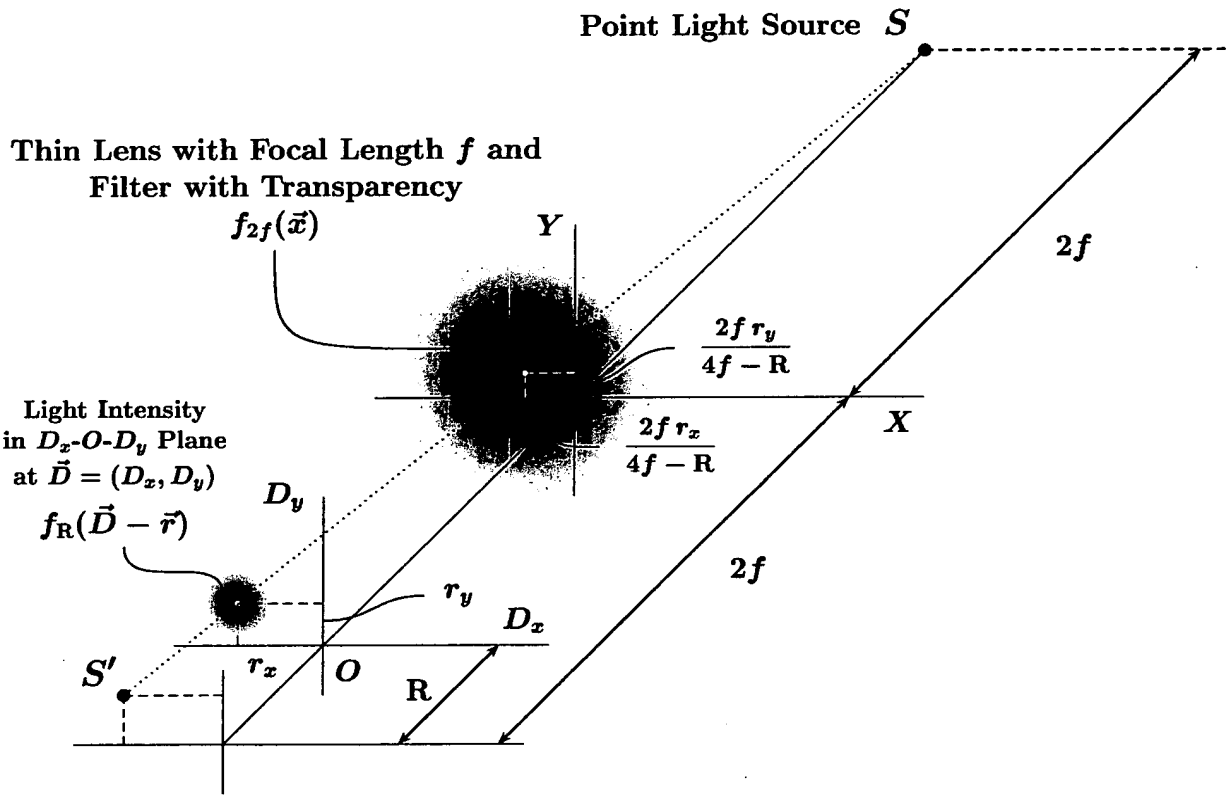
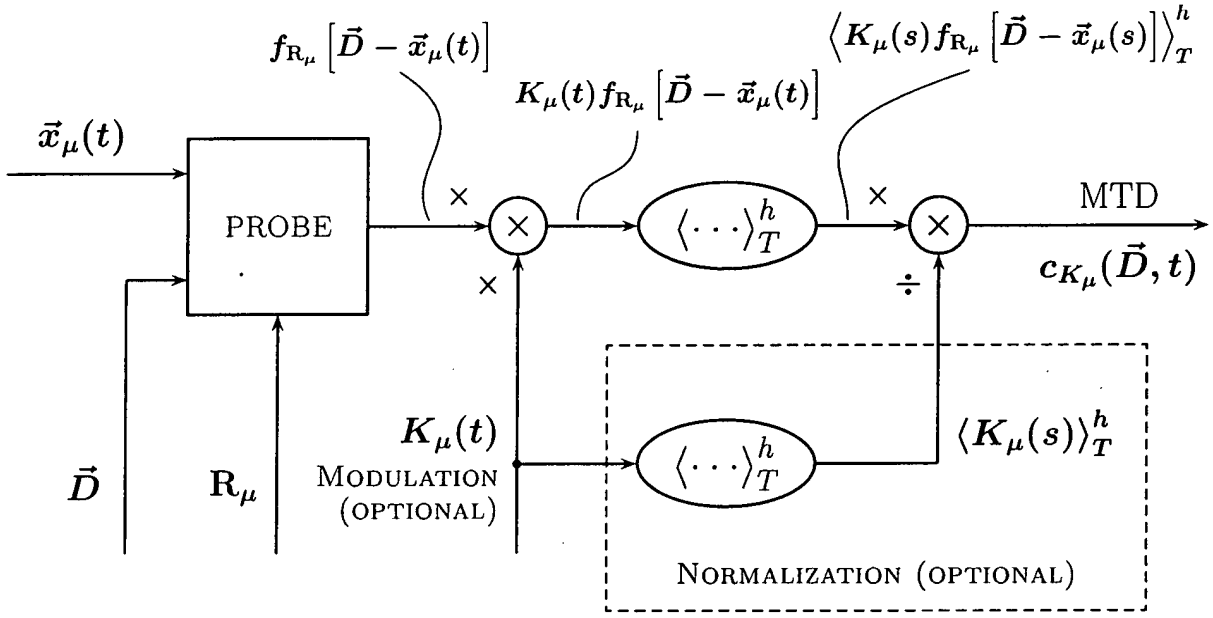



Fig. 6

09624564 - 060304

MTD FOR SINGLE VARIABLE / COMPONENT OF ENSEMBLE




ACQUISITION SYSTEM: MEASURING DEVICE (PROBE)
HAS INPUT-OUTPUT CHARACTERISTIC OF DIFFERENTIAL DISCRIMINATOR.

$\vec{x}_\mu(t)$ IS INPUT VARIABLE, SCALAR OR VECTOR, OR COMPONENT OF ENSEMBLE.
E.G., SURFACE (IMAGE) GIVEN BY MATRIX CAN BE VIEWED AS DISCRETE ENSEMBLE.

$\vec{D}$ AND $R_\mu$ ARE PARAMETERS OF PROBE. $\vec{D}$ IS ANOTHER VARIABLE (NORMALLY OF SAME NATURE AS INPUT VARIABLE), SERVING AS UNIT, OR DATUM. $R_\mu$ IS WIDTH, OR RESOLUTION, PARAMETER.

$K_\mu(t)$ IS MODULATING VARIABLE, GENERALLY OF DIFFERENT NATURE THAN INPUT VARIABLE. E.G., $K_\mu(t) = \text{constant}$ LEADS TO MTD AS AMPLITUDE DENSITY, AND $K_\mu(t) = |\dot{\vec{x}}_\mu(t)|$ LEADS TO MTD AS COUNTING DENSITY/RATE.

Fig. 7

EL388608922US

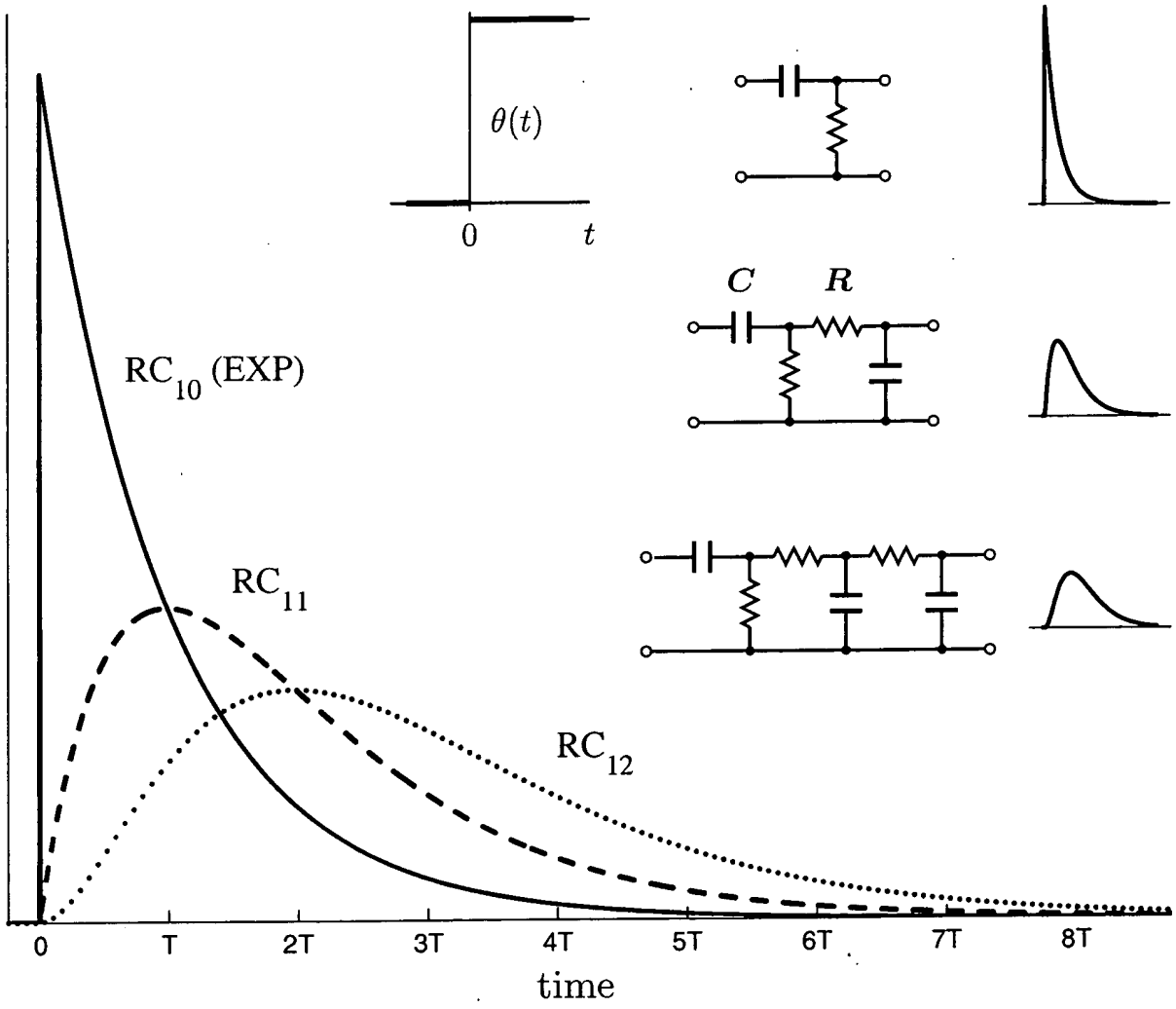



Fig. 8

EL388608922US

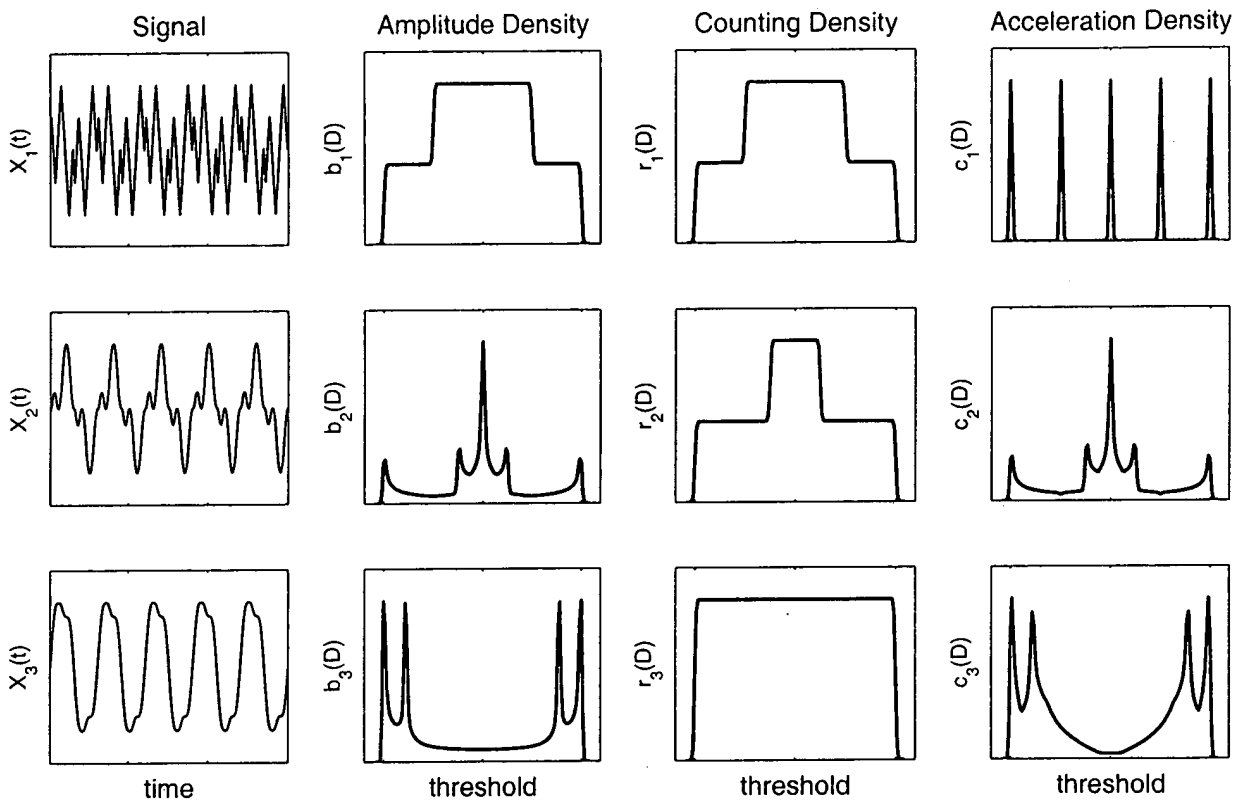



Fig. 9 a

PCT/US03/41525

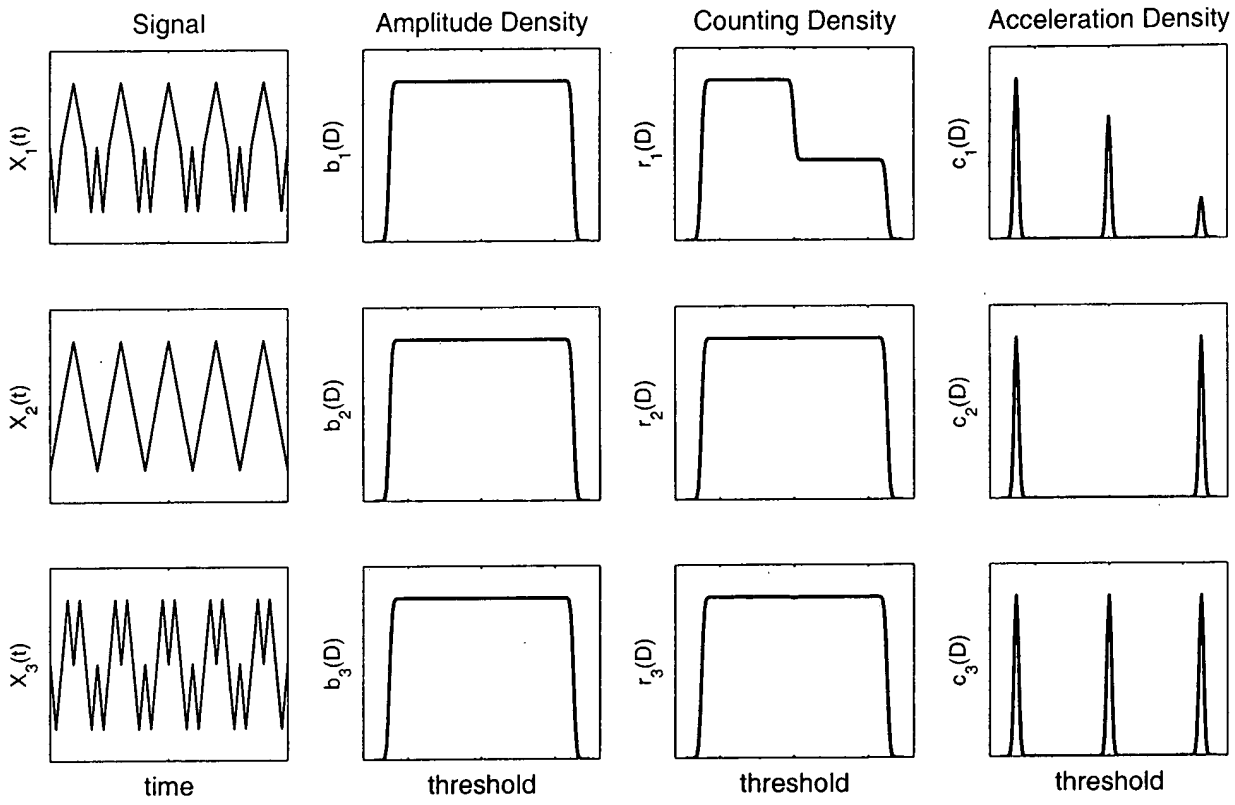



Fig. 9b

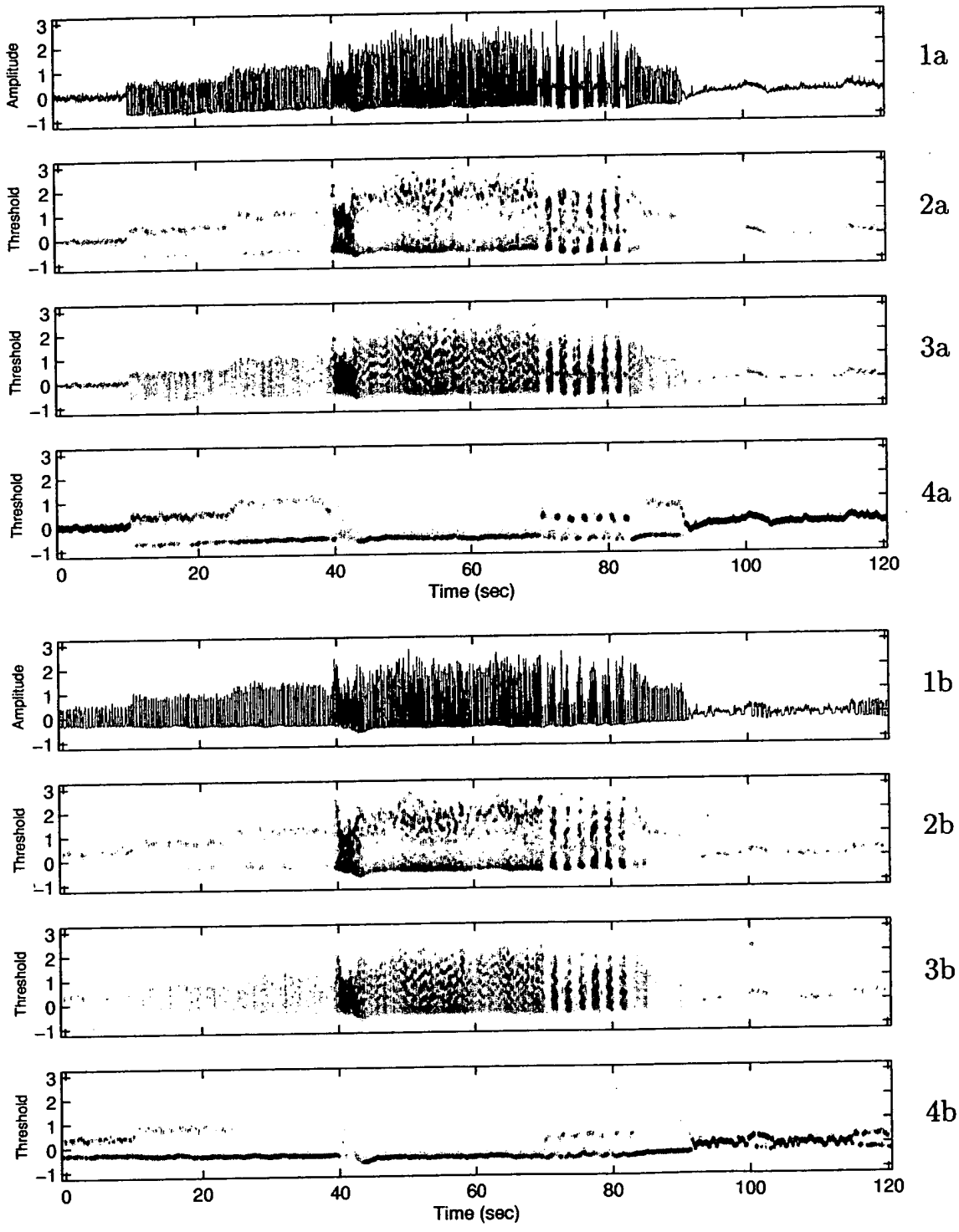

Amplitude
Threshold
1a
2a
3a
4a
1b
2b
3b
4b
Time (sec)
0
20
40
60
80
100
120

Fig. 10

EL388608922US

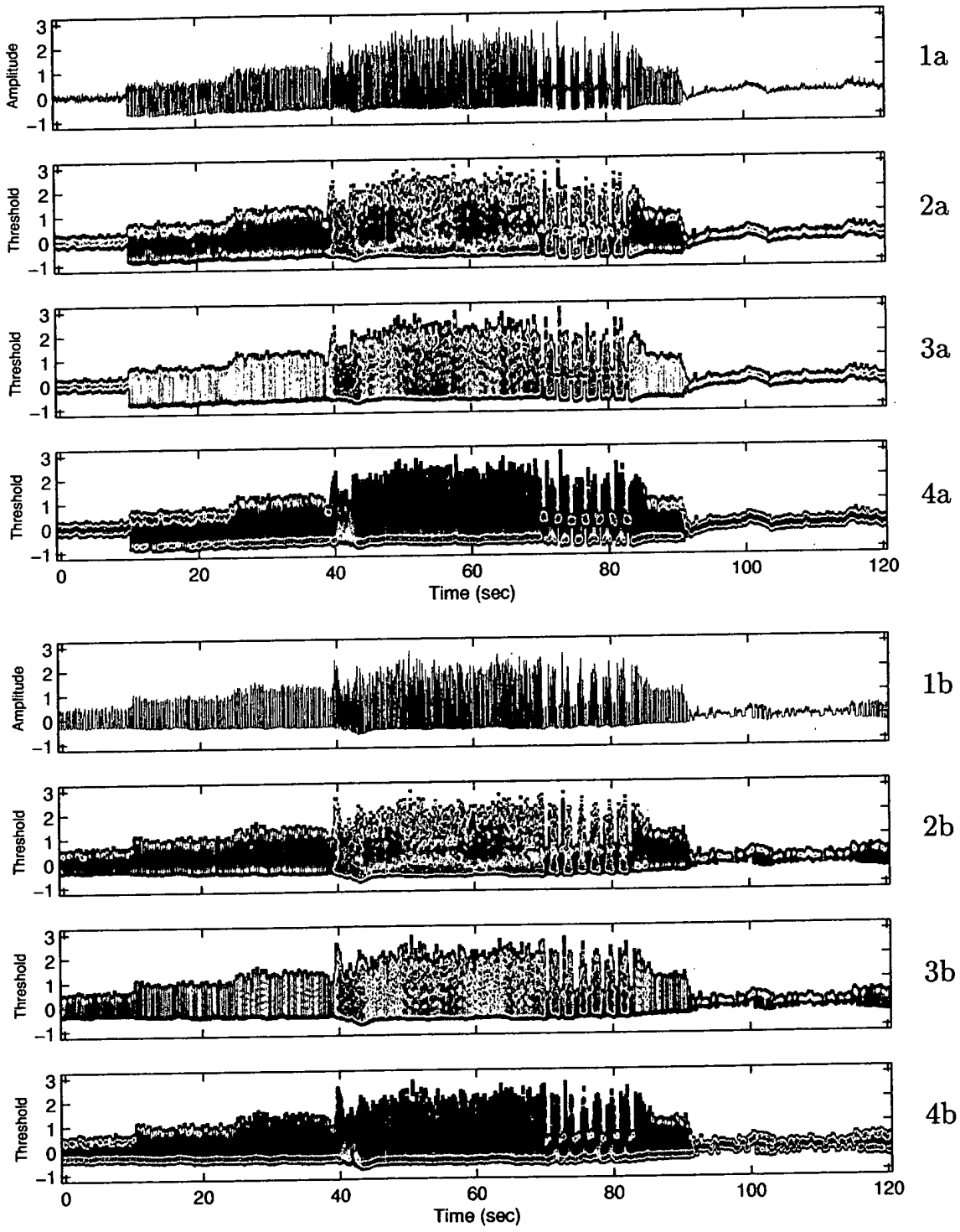



Fig. 10

attorney docket 15252.2

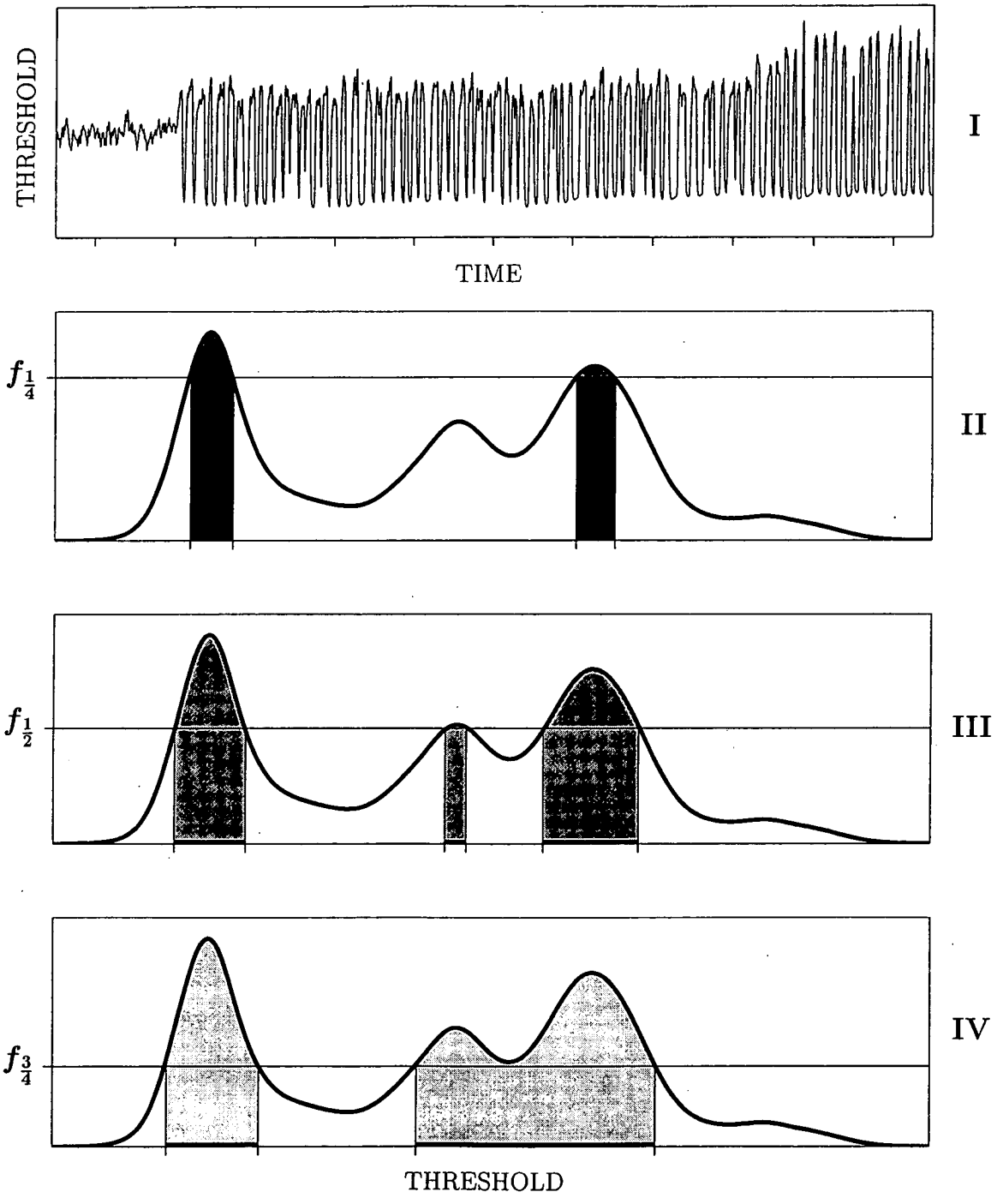



Fig. 11

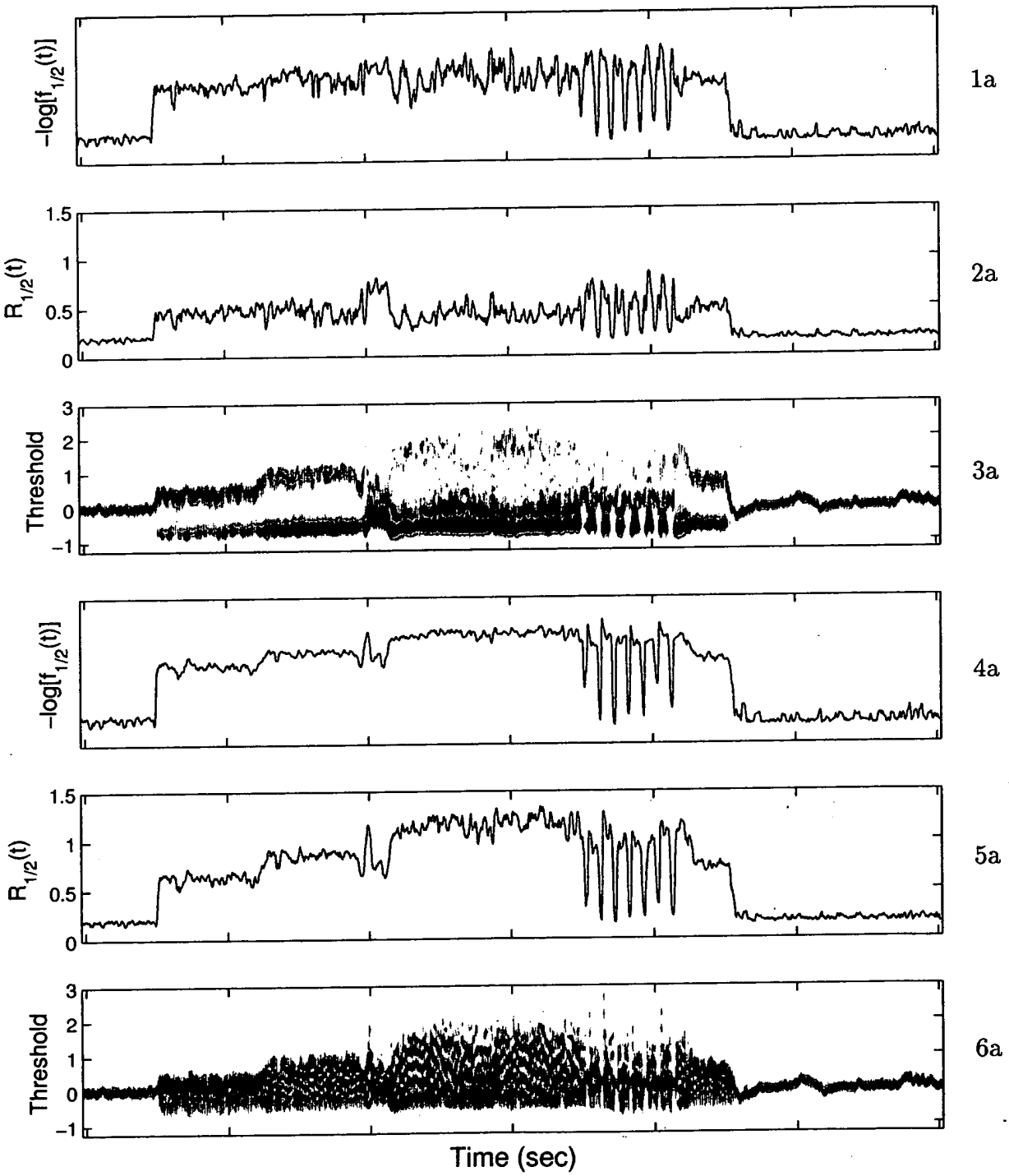

-log[f1/2(t)]
1a
1.5
1
0.5
0
R1/2(t)
2a
3
2
1
0
-1
Threshold
3a
-log[f1/2(t)]
4a
1.5
1
0.5
0
R1/2(t)
5a
3
2
1
0
-1
Threshold
6a
Time (sec)

Fig. 12a

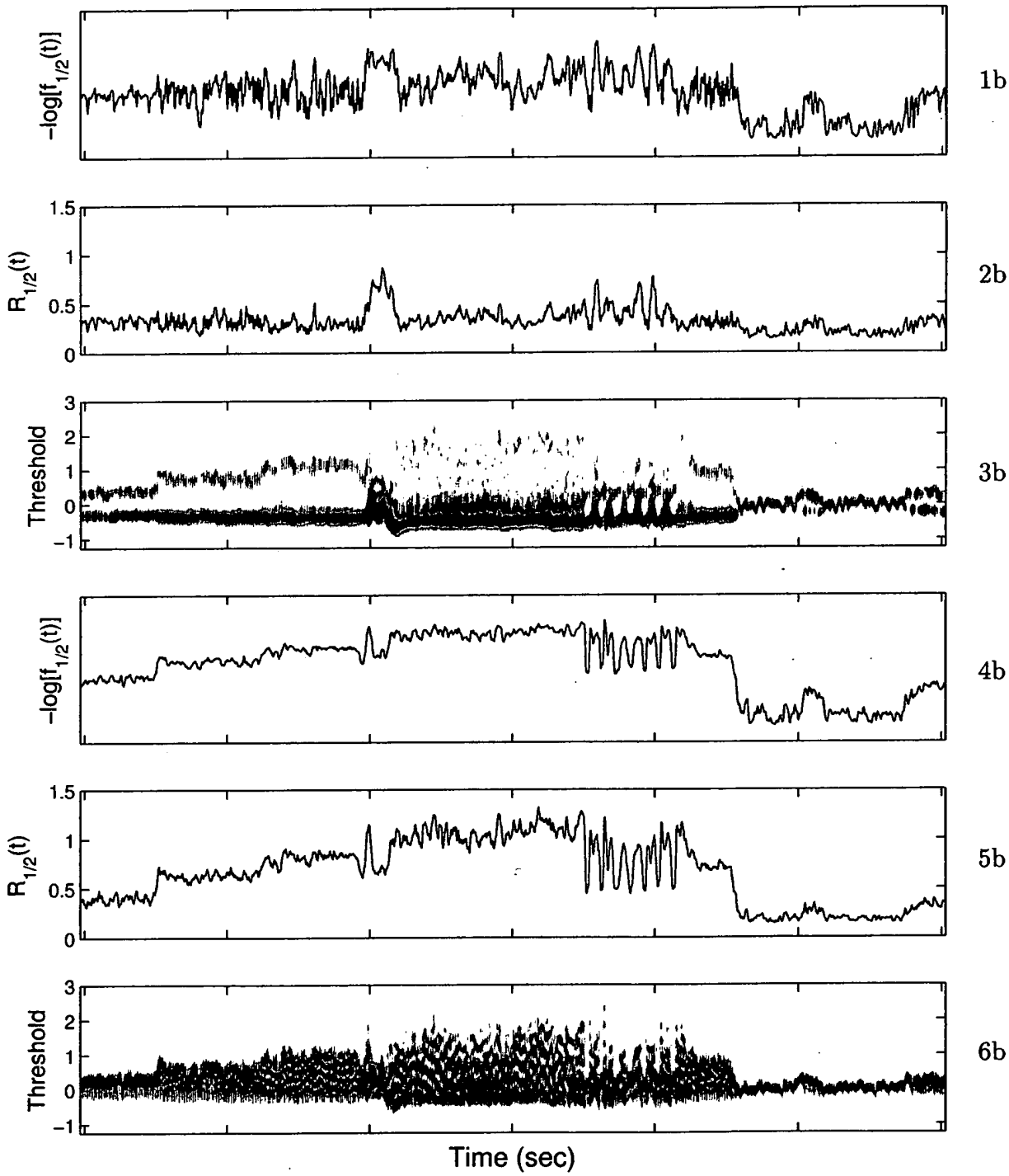

-log[f1/2(t)]
1b
R1/2(t)
1.5
1
0.5
0
2b
Threshold
3
2
1
0
-1
3b
-log[f1/2(t)]
4b
R1/2(t)
5b
Threshold
6b
Time (sec)

Fig. 12b

EL388608922US

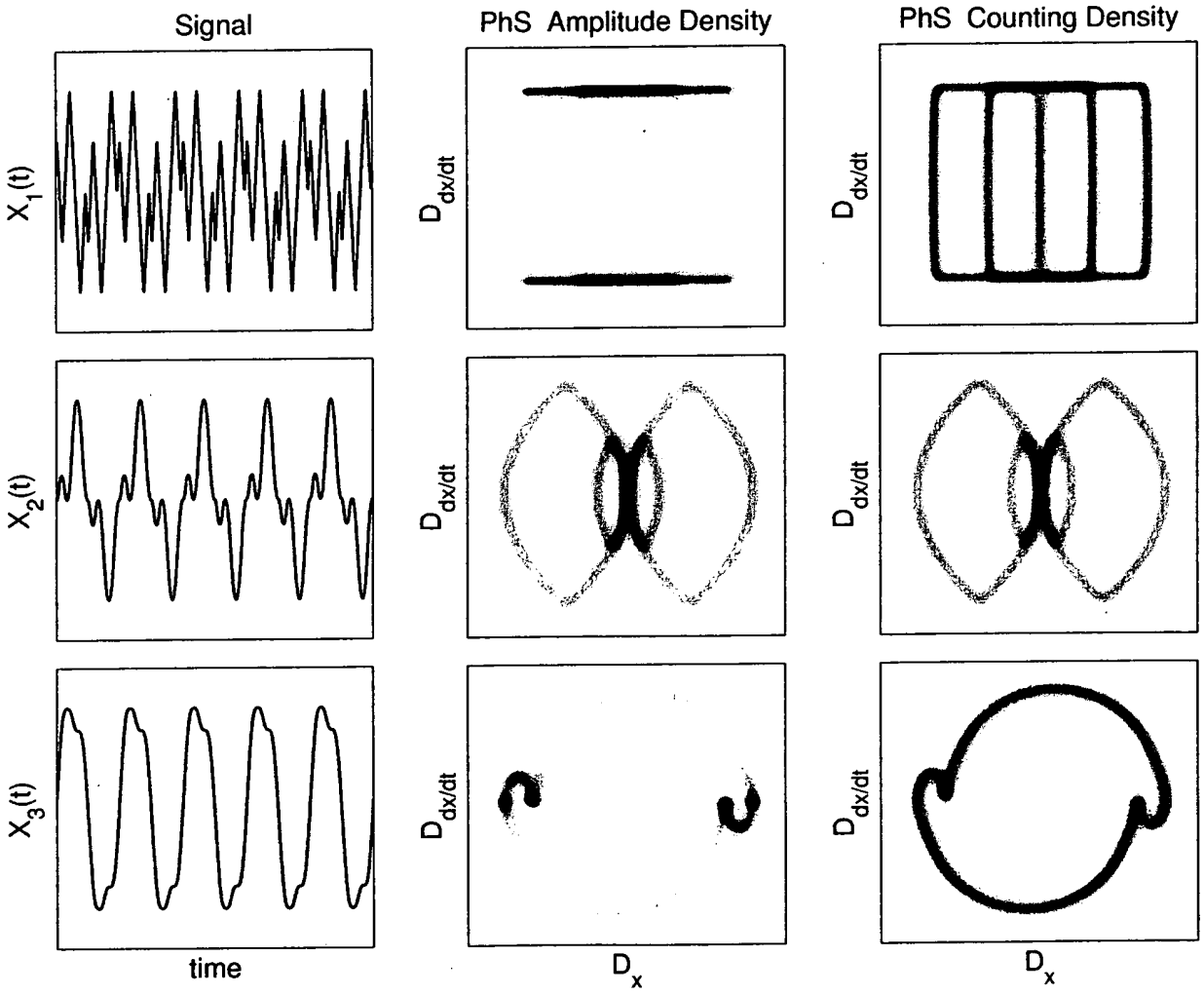



Fig. 13

Express Mail Label No. EL388608922US

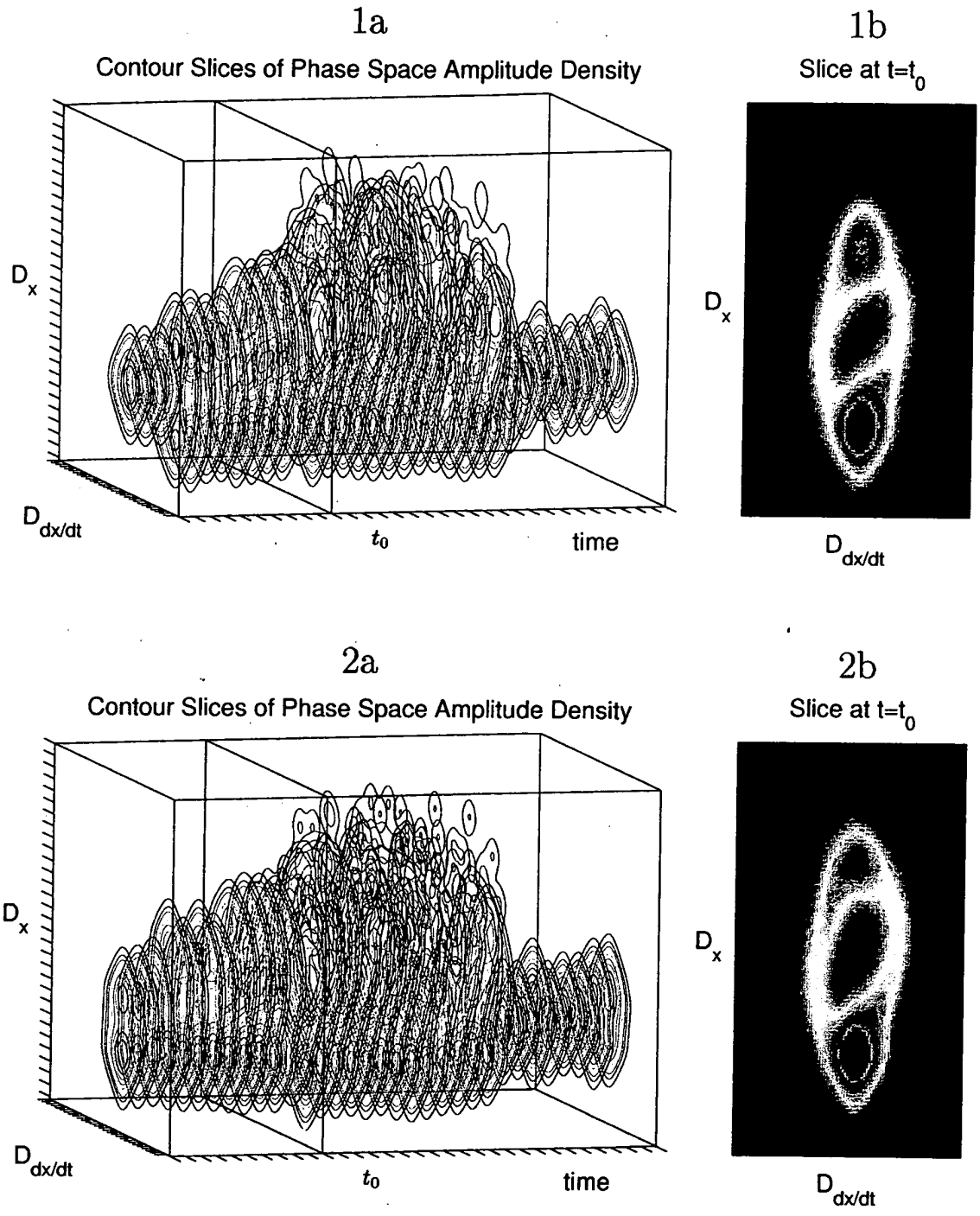
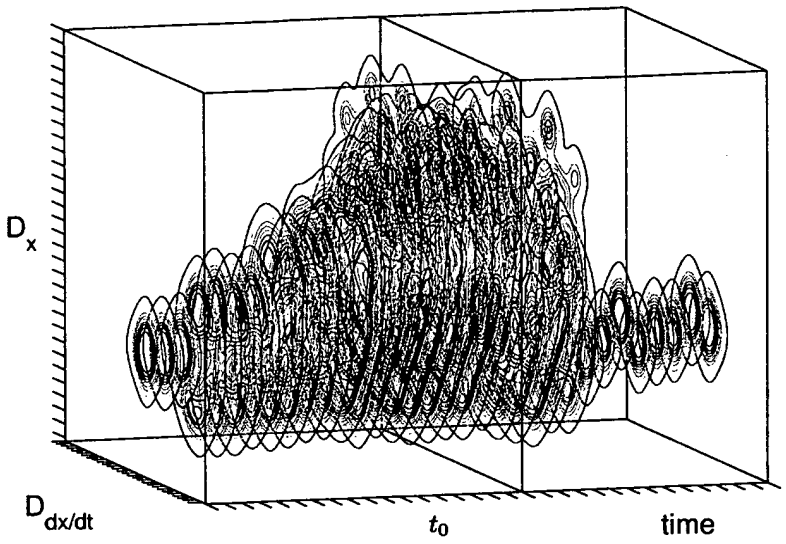



Fig. 14

Tue Sep 30 14:55:25 2003

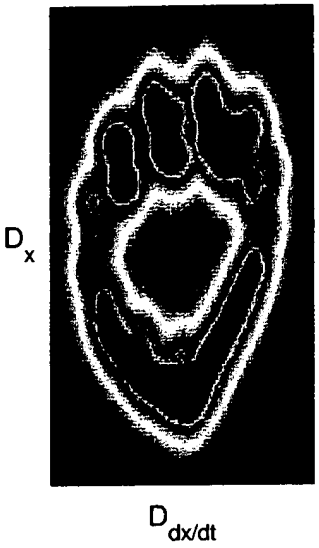
1a

Contour Slices of Phase Space Counting Rates



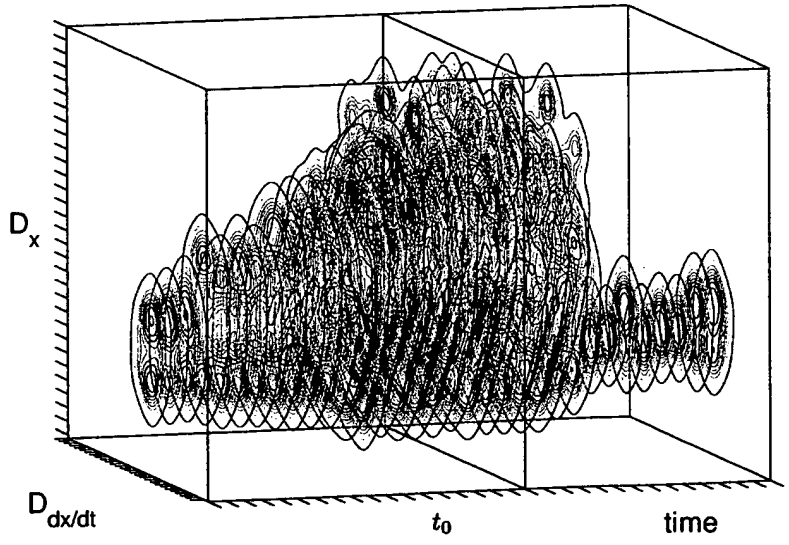

1b

Slice at $t=t_0$




2a

Contour Slices of Phase Space Counting Rates




2b

Slice at $t=t_0$

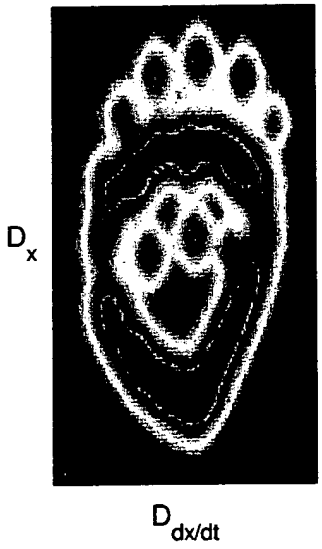



Fig. 15

EL388608922US

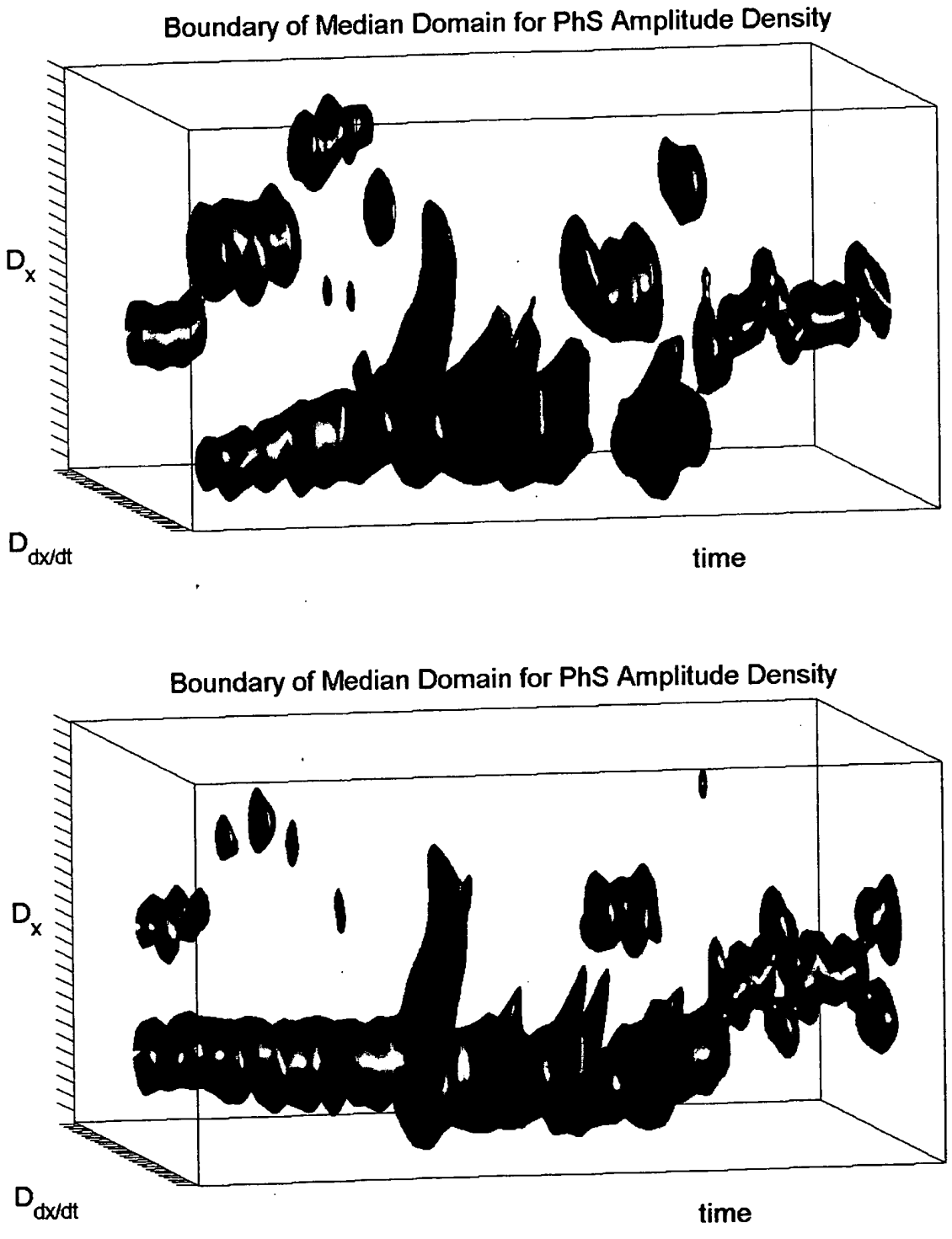



Fig. 16

09634524.080904

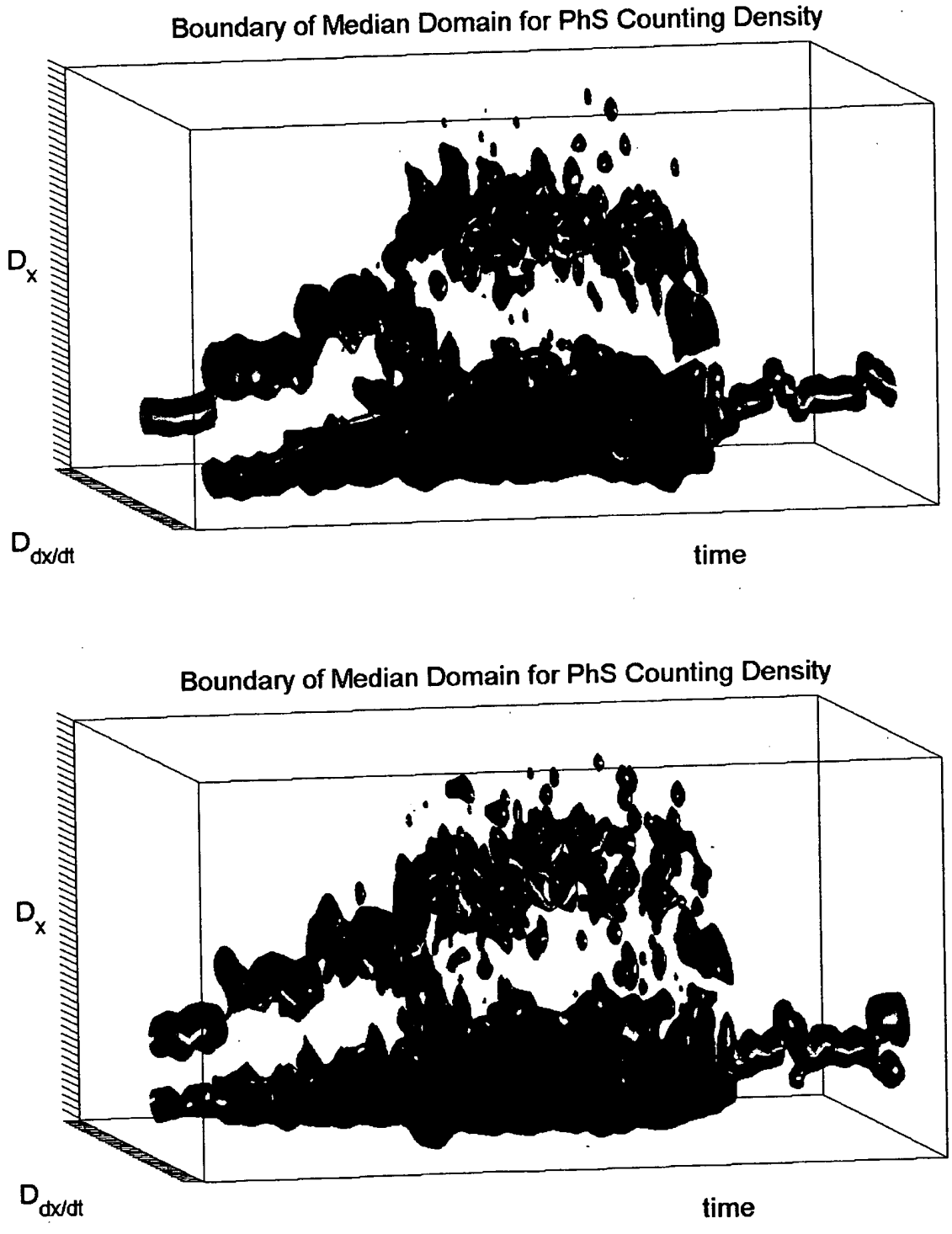



Fig. 17

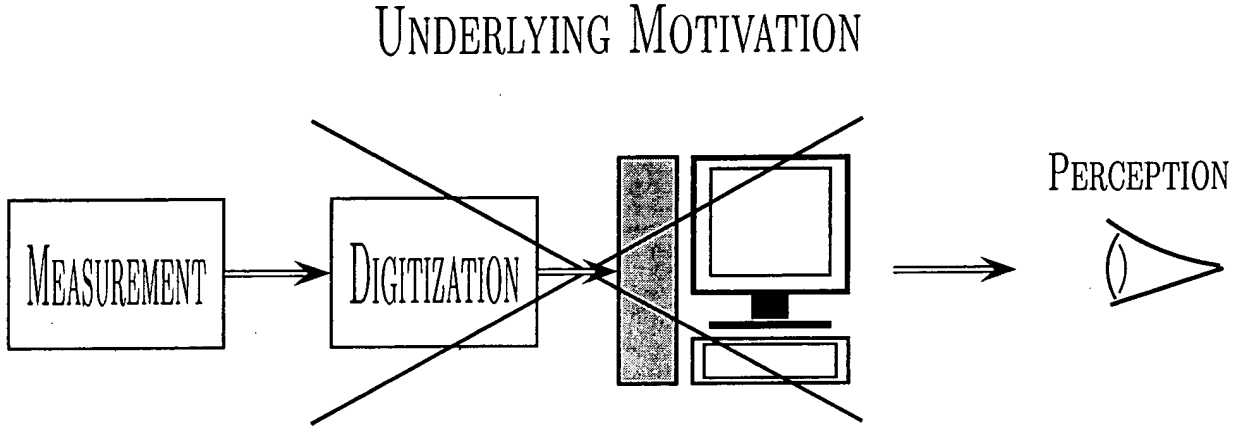



Fig. 18

4038524-080304

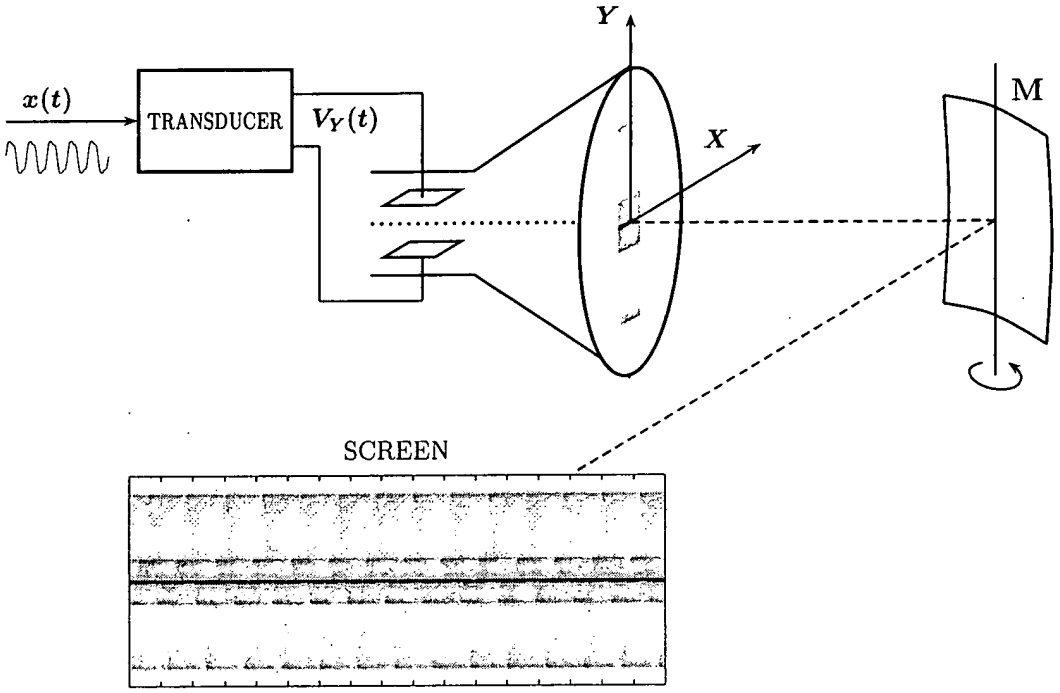

Y
x(t)
TRANSDUCER
$V_Y(t)$
X
M
SCREEN

Fig. 19

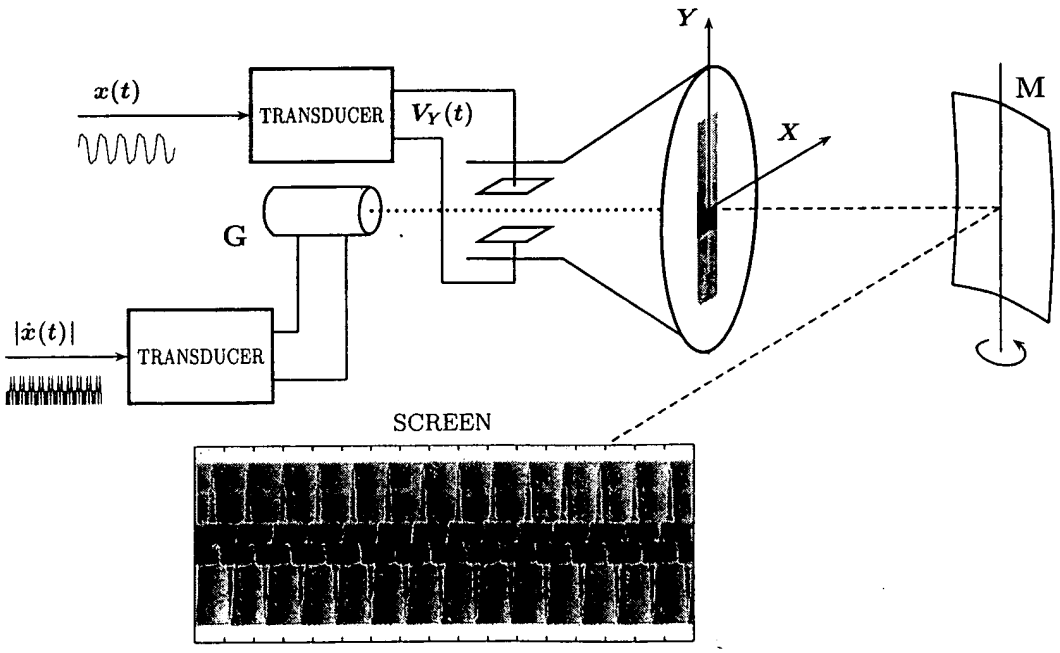

Y
x(t)
TRANSDUCER
$V_Y(t)$
X
M
G
$|\dot{x}(t)|$
TRANSDUCER
SCREEN

Fig. 20

Doc Code: AP.PRE.REQ Filed: 2008-04-25

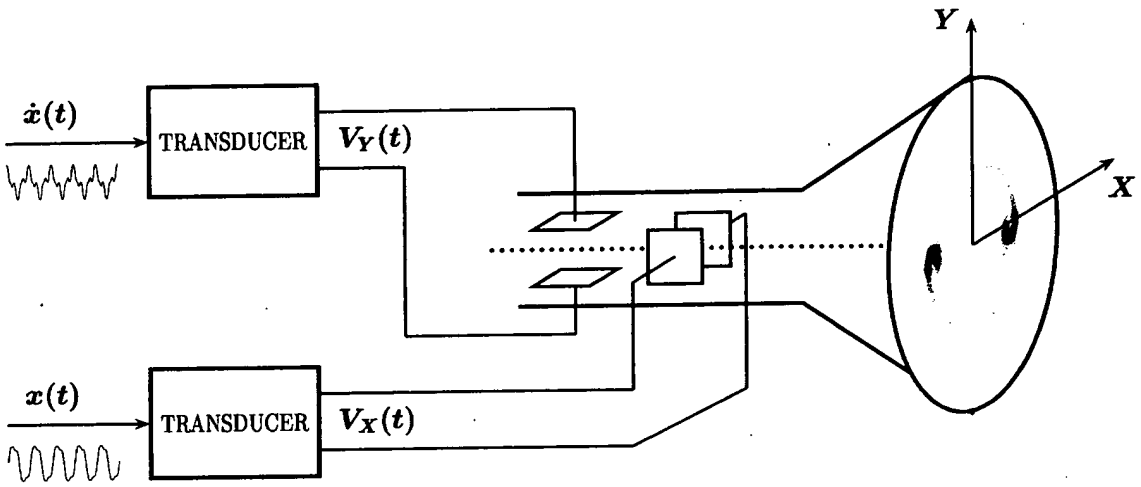



Fig. 21

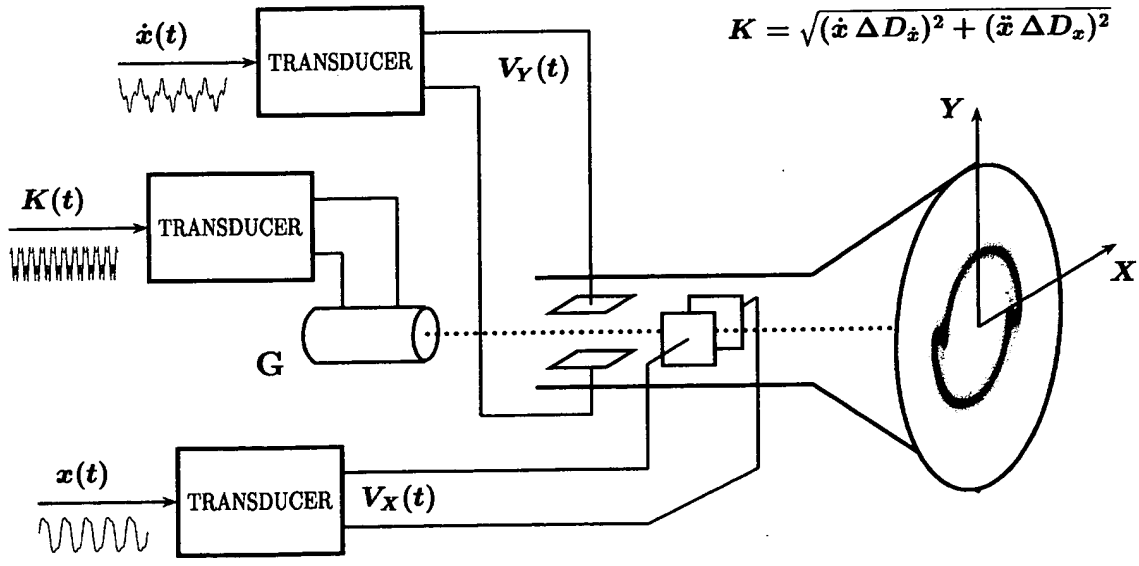



Fig. 22

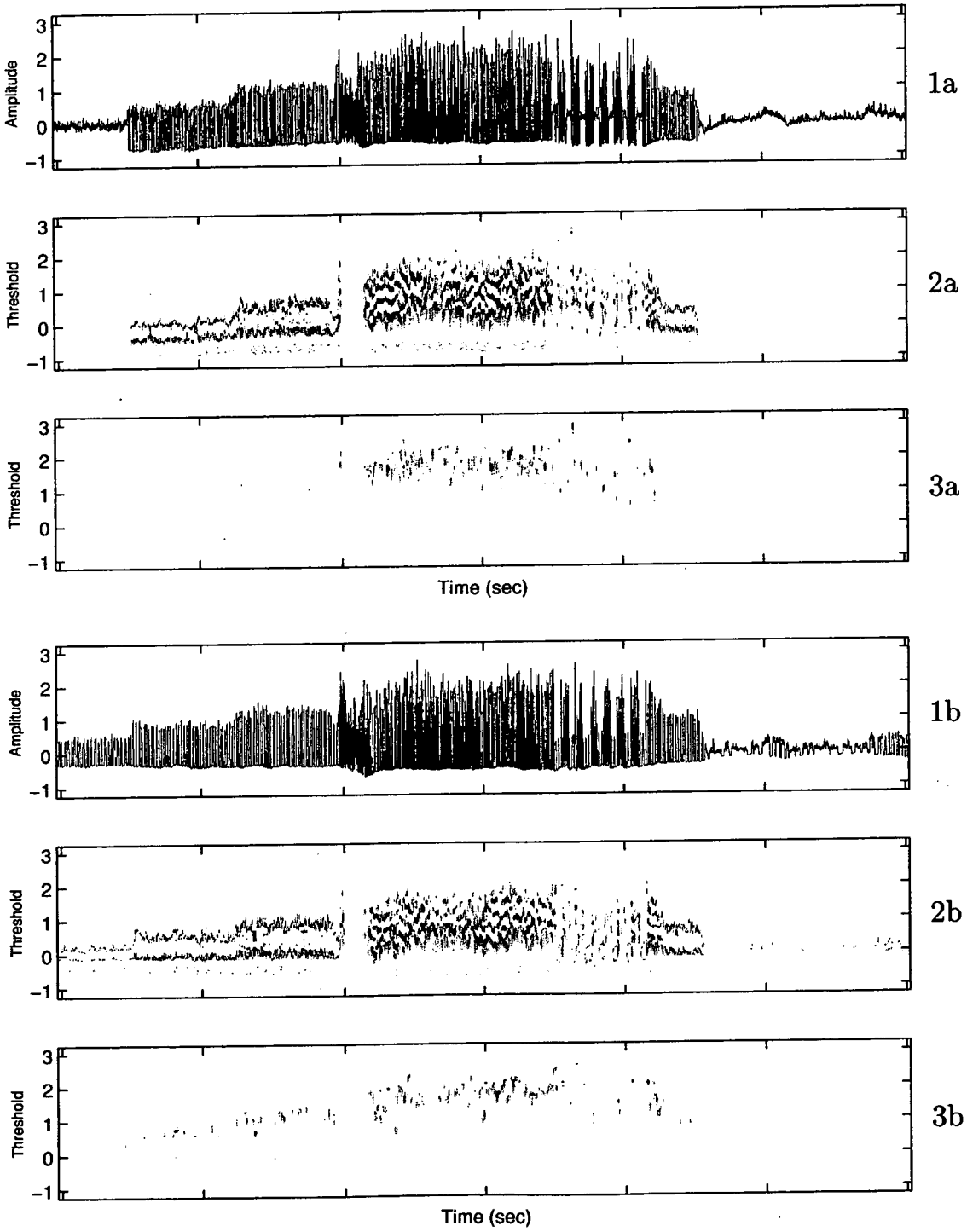

Amplitude
Threshold
Threshold
Time (sec)
Amplitude
Threshold
Threshold
Time (sec)
1a
2a
3a
1b
2b
3b

Fig. 23

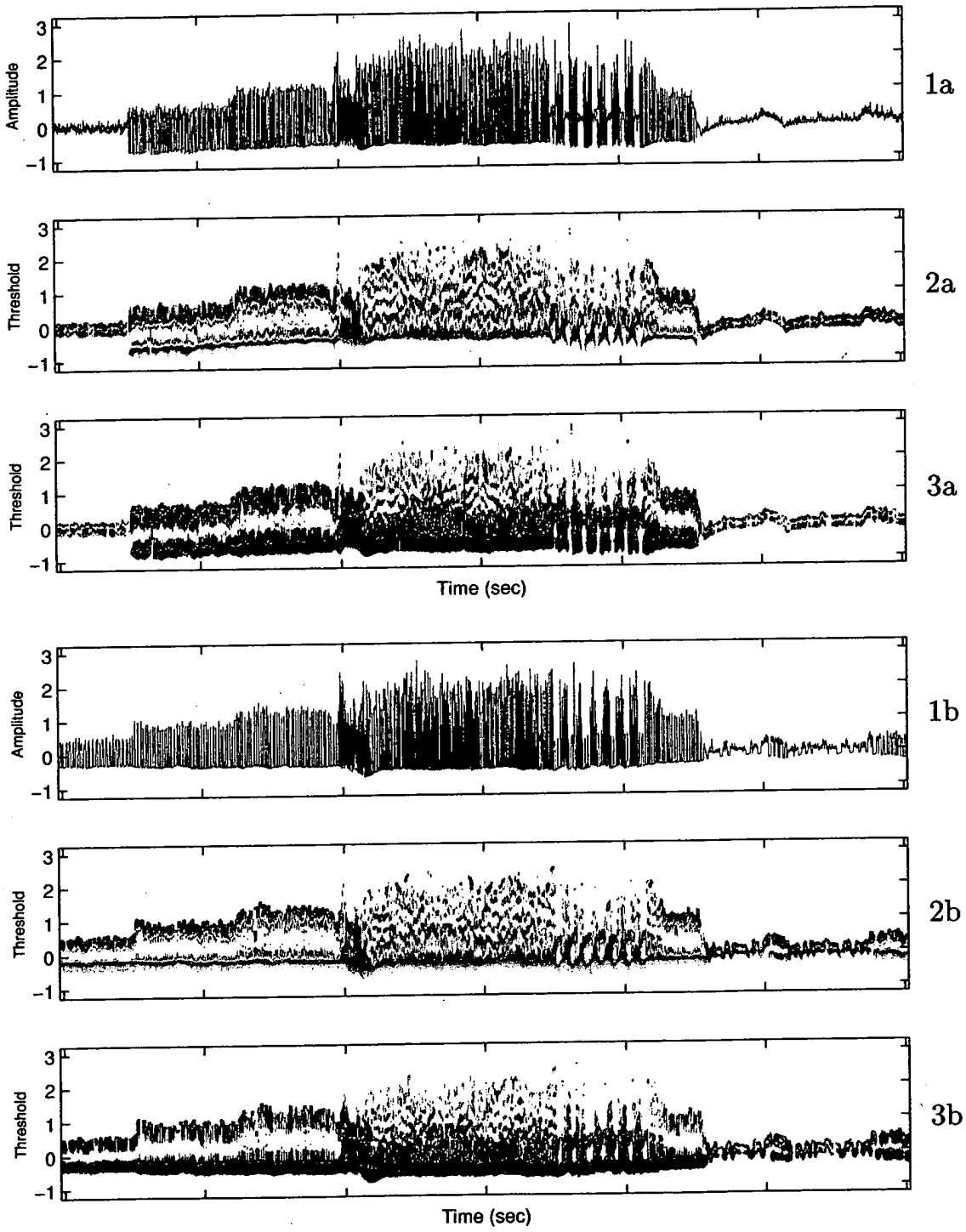



Fig. 23

EL388608922US

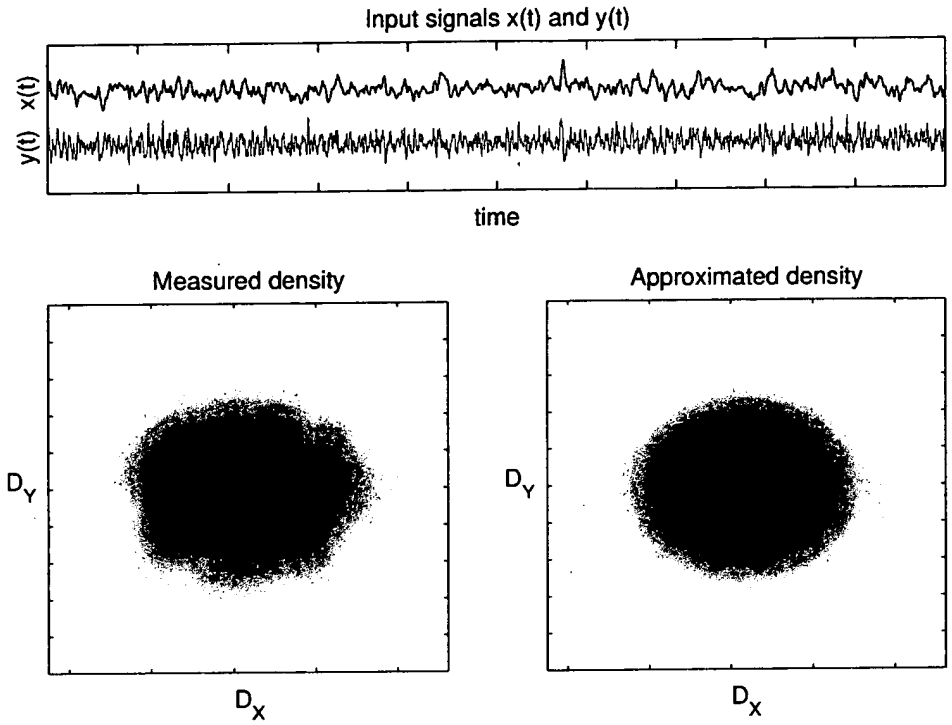



Fig. 24

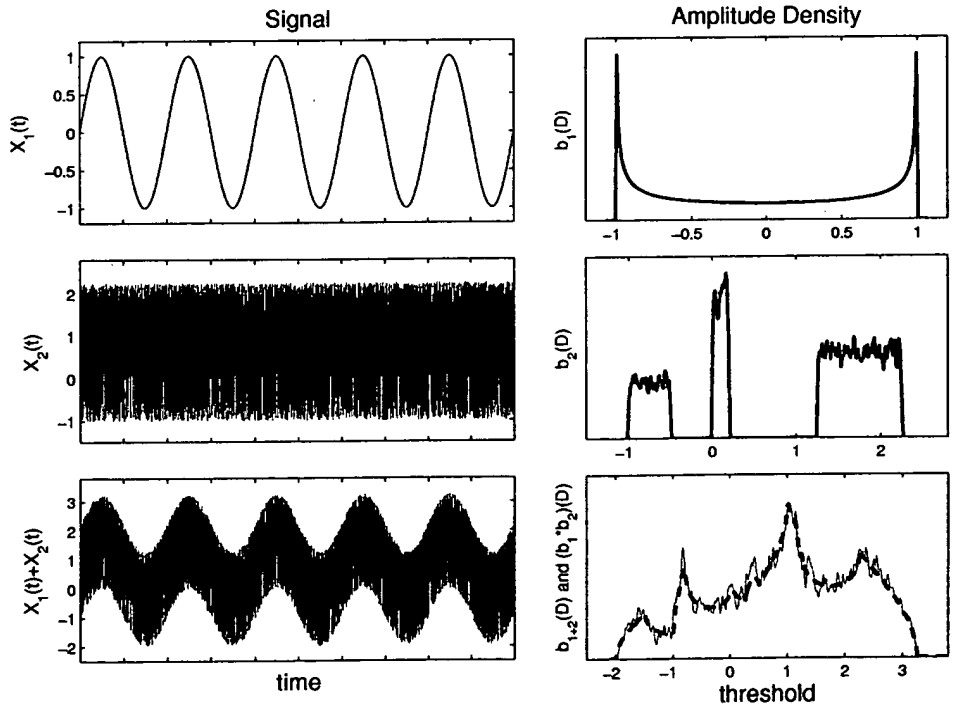



Fig. 25

EL388608922US

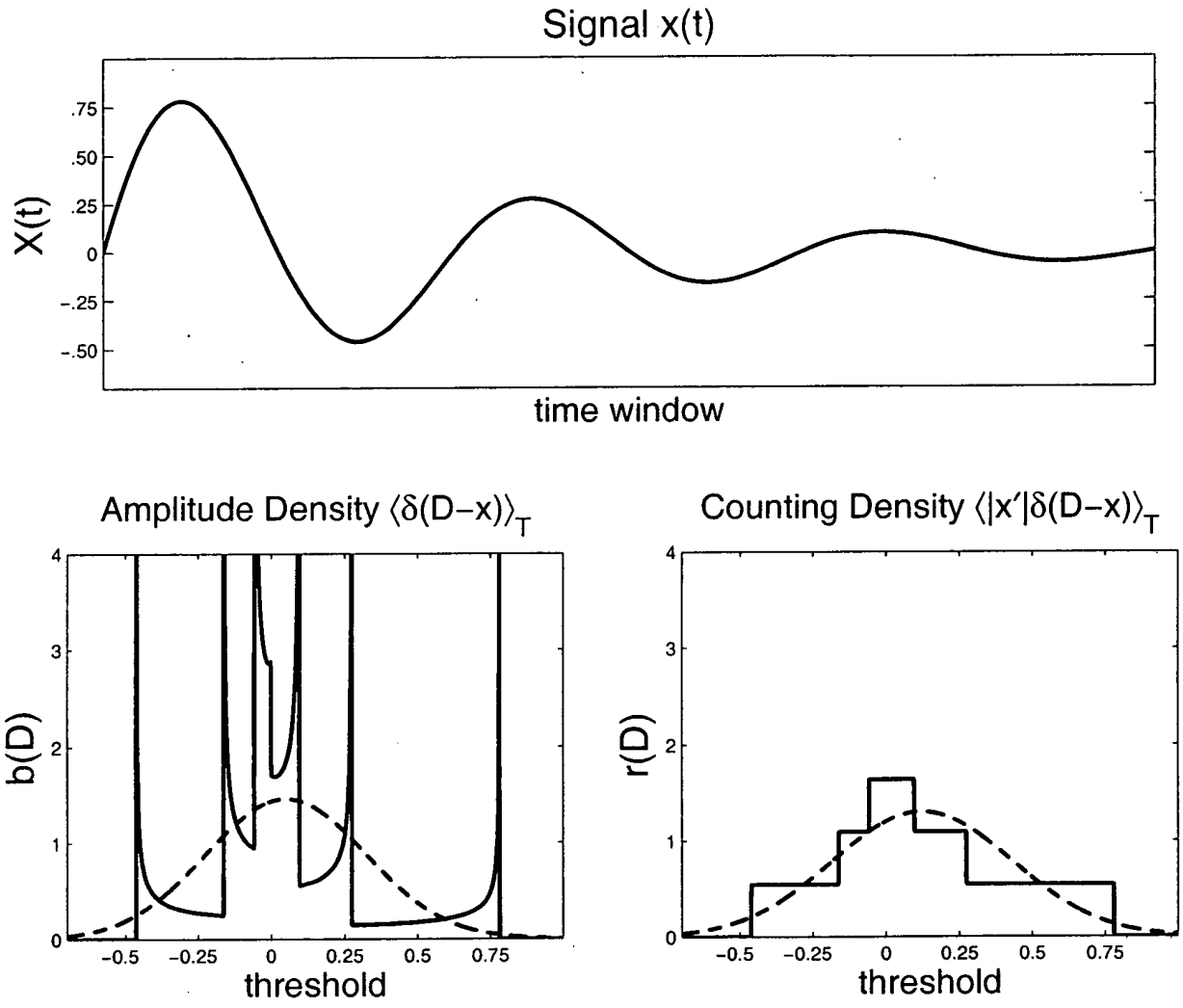



Fig. 26

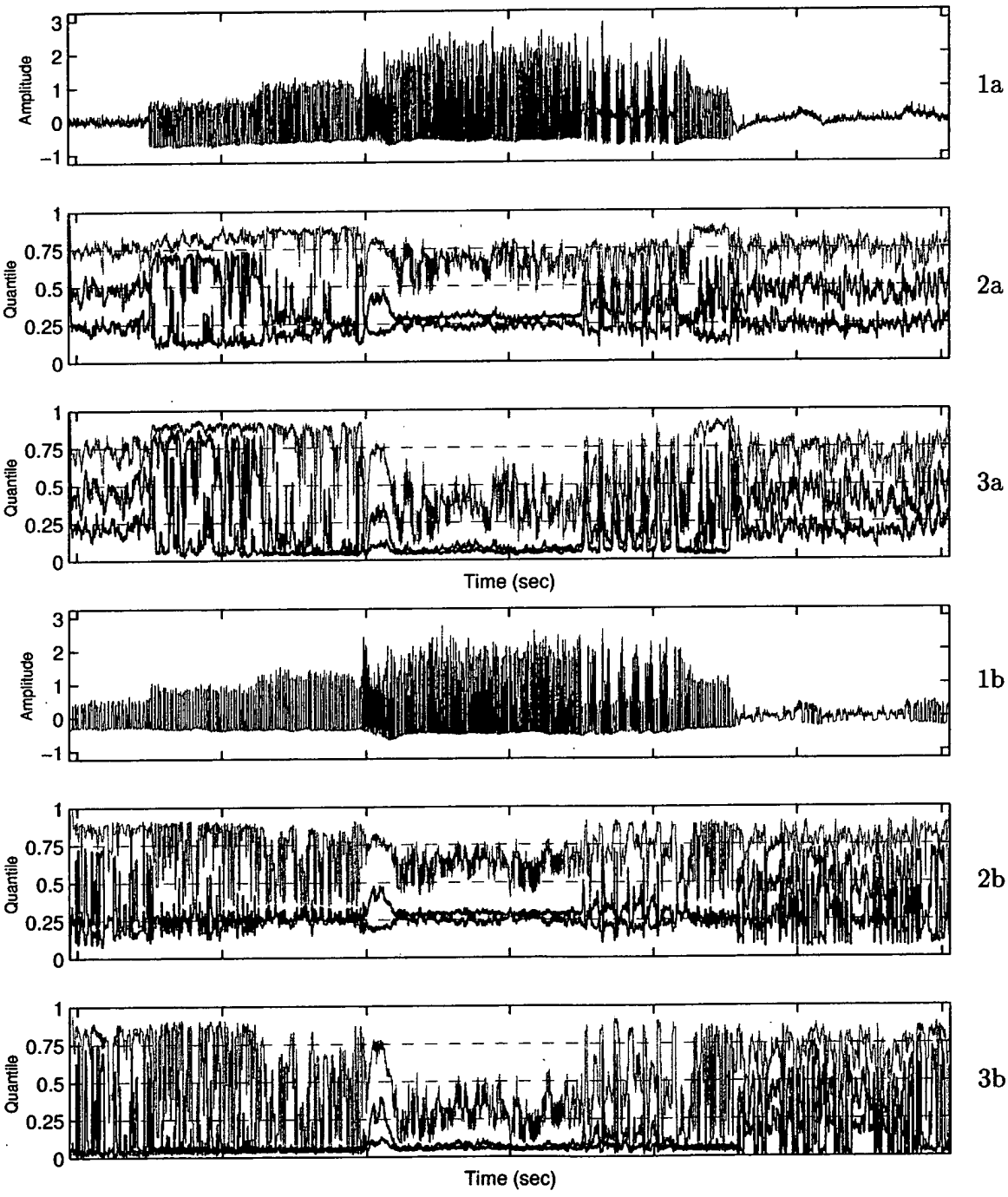



Fig. 27

0050545 - 0000301

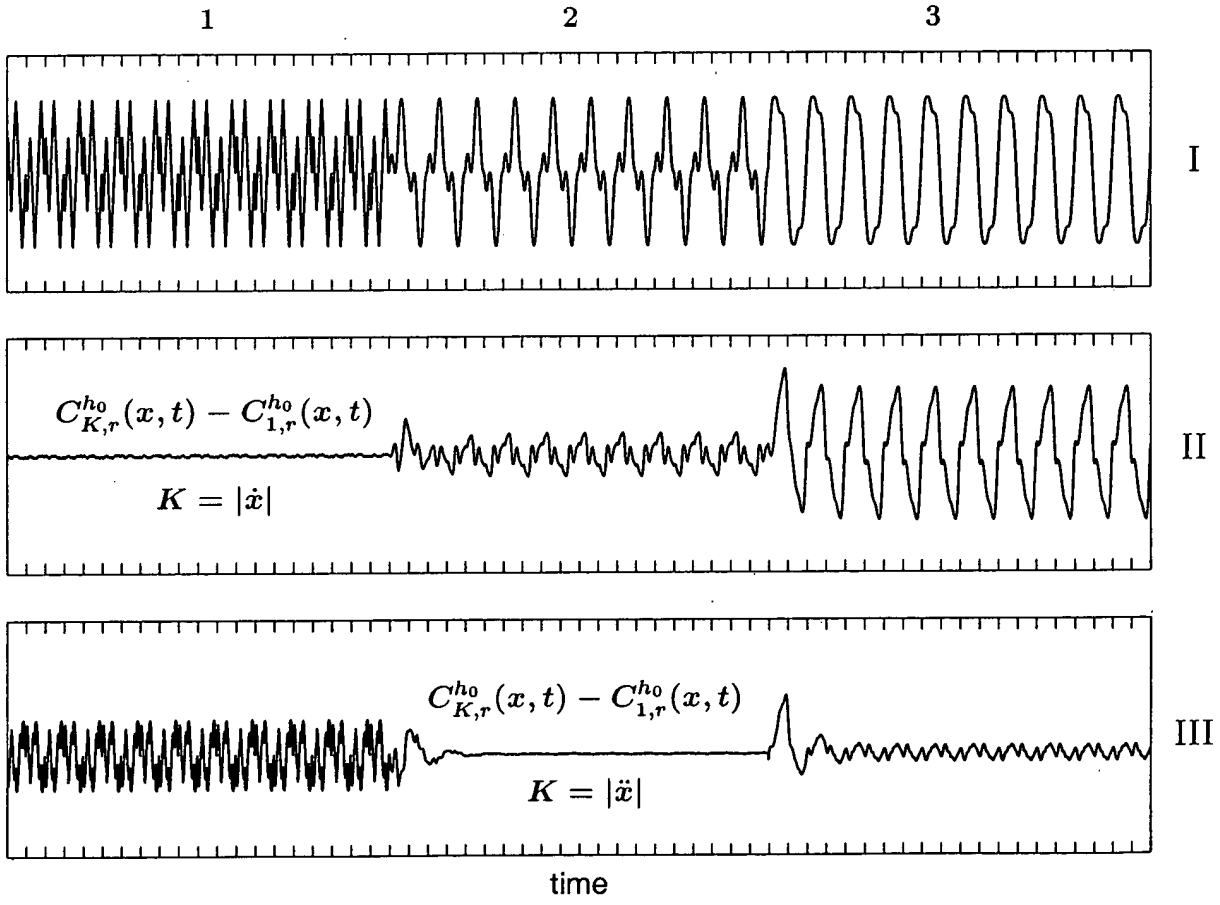



Fig. 28

09245240-060301

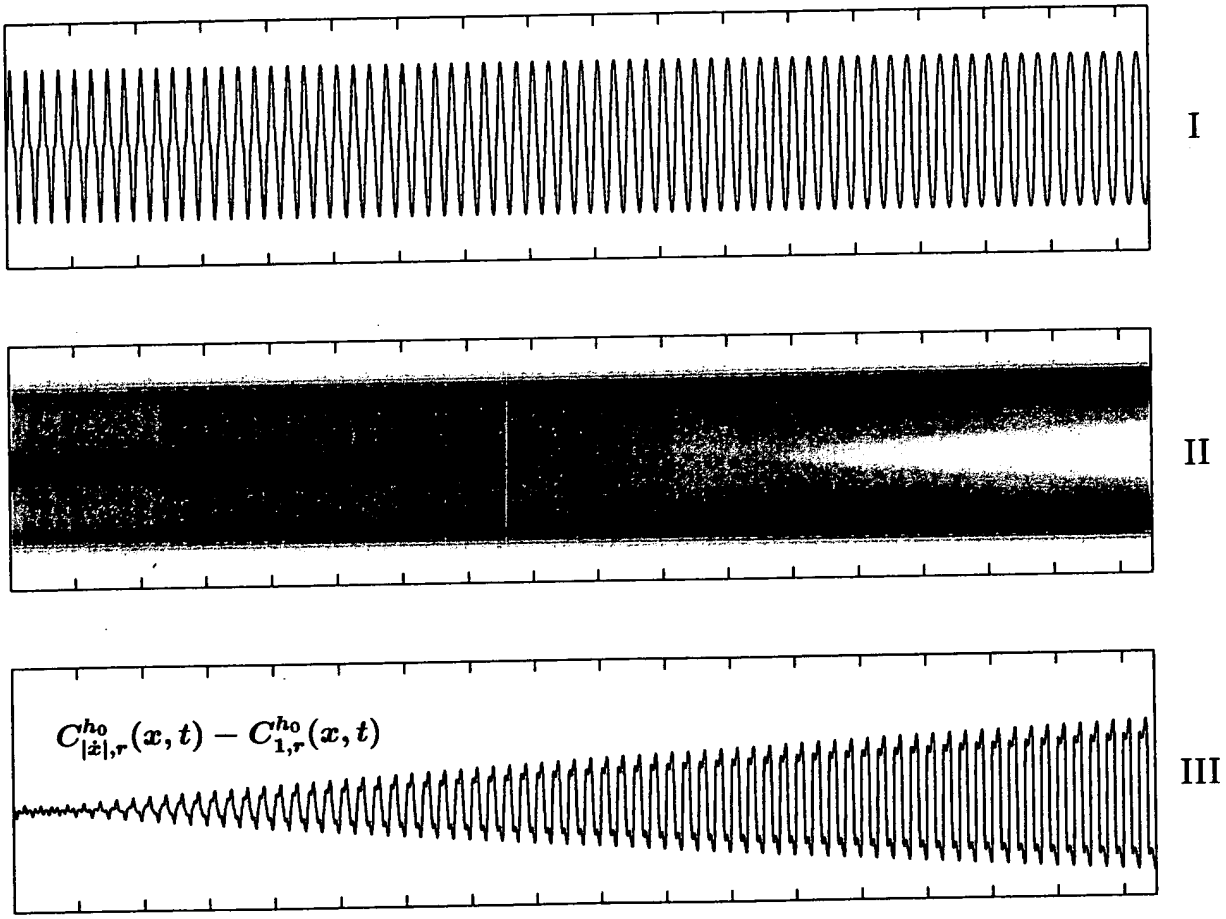



Fig. 29

0925252-080901

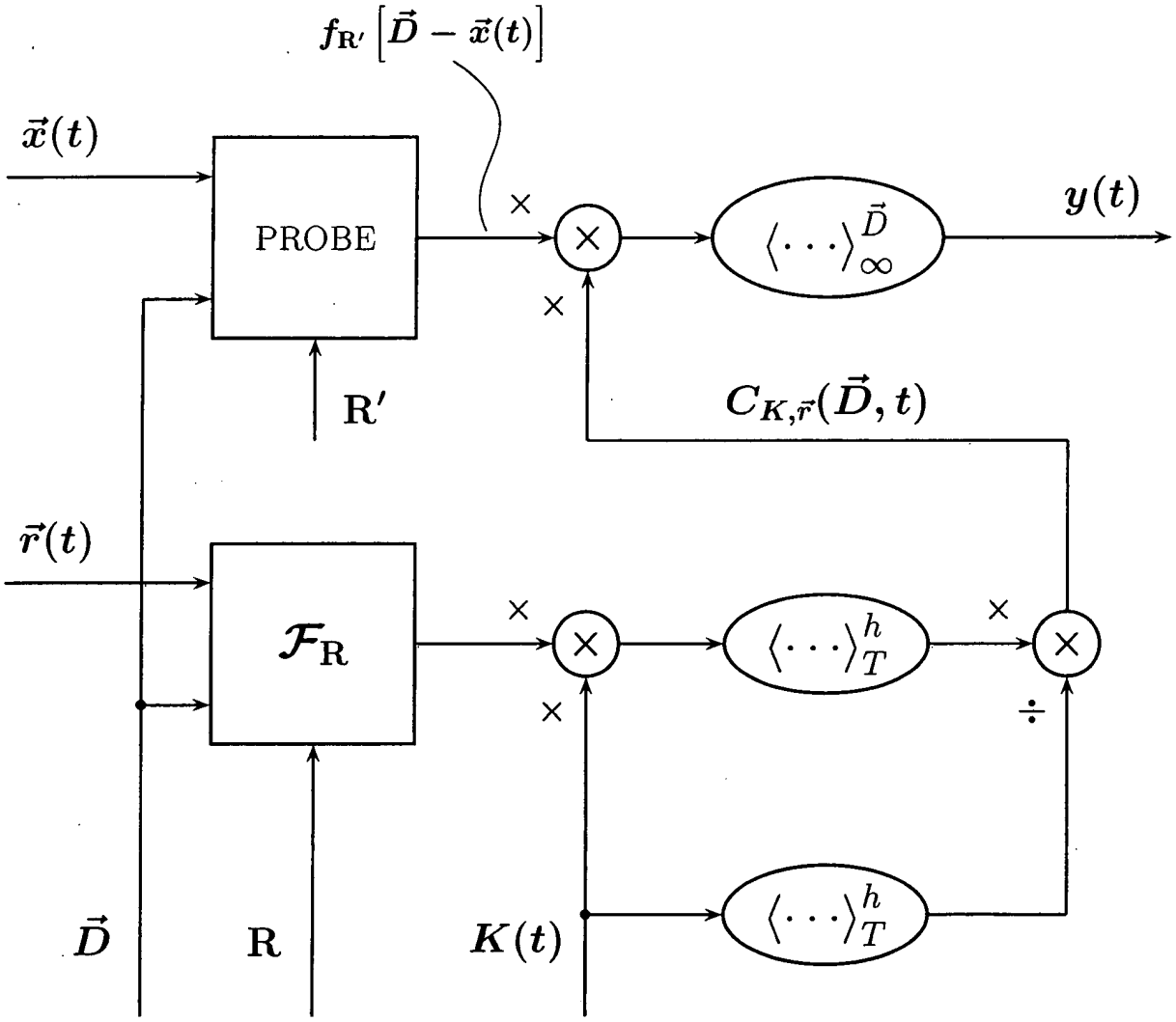
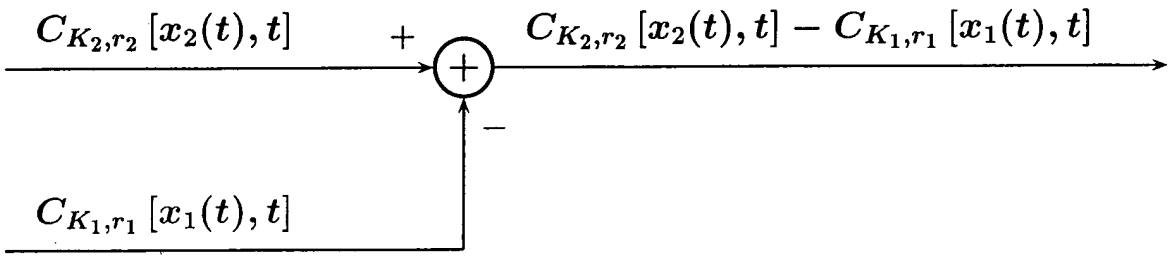



Fig. 30


$C_{K_2,r_2}[x_2(t),t]$
+
$C_{K_2,r_2}[x_2(t),t] - C_{K_1,r_1}[x_1(t),t]$
−
$C_{K_1,r_1}[x_1(t),t]$

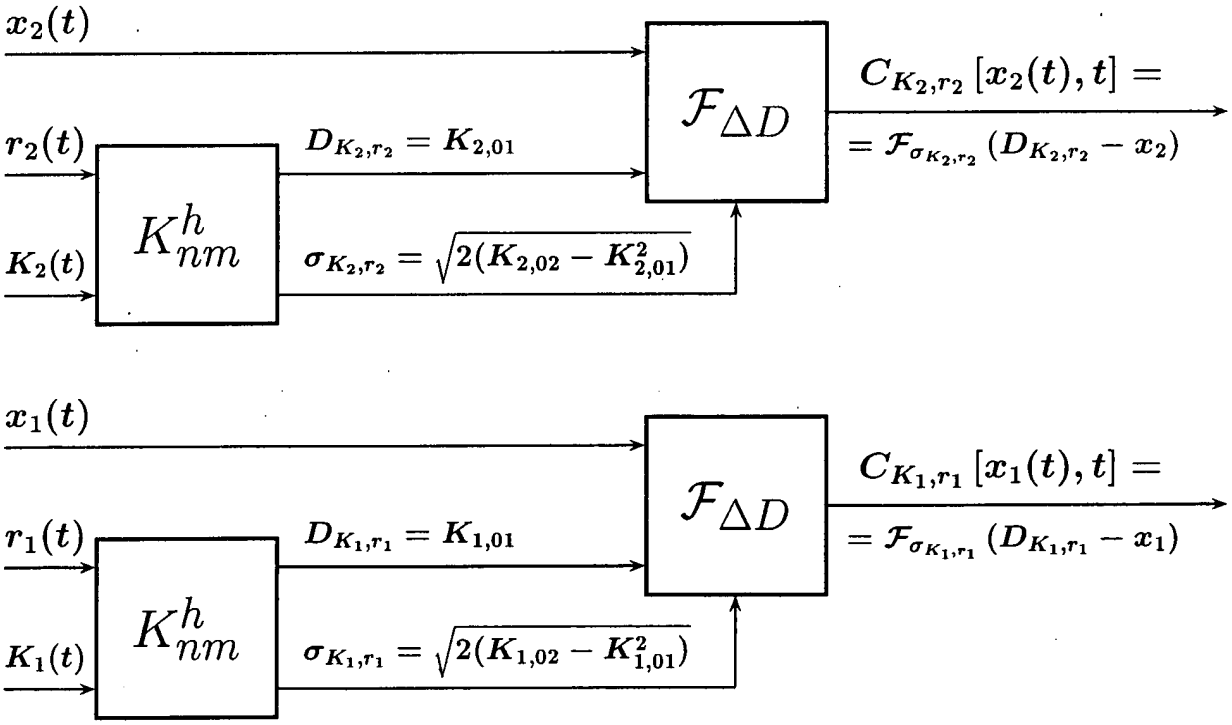

$x_2(t)$
$r_2(t)$
$K_2(t)$
$K^h_{nm}$
$D_{K_2,r_2} = K_{2,01}$
$\sigma_{K_2,r_2} = \sqrt{2(K_{2,02} - K^2_{2,01})}$
$\mathcal{F}_{\Delta D}$
$C_{K_2,r_2}[x_2(t),t] =$
$= \mathcal{F}_{\sigma_{K_2,r_2}}(D_{K_2,r_2} - x_2)$
$x_1(t)$
$r_1(t)$
$K_1(t)$
$K^h_{nm}$
$D_{K_1,r_1} = K_{1,01}$
$\sigma_{K_1,r_1} = \sqrt{2(K_{1,02} - K^2_{1,01})}$
$\mathcal{F}_{\Delta D}$
$C_{K_1,r_1}[x_1(t),t] =$
$= \mathcal{F}_{\sigma_{K_1,r_1}}(D_{K_1,r_1} - x_1)$

Fig. 31

0.5.0.5.4.5.5.4.0.8.8.0.3.0.4

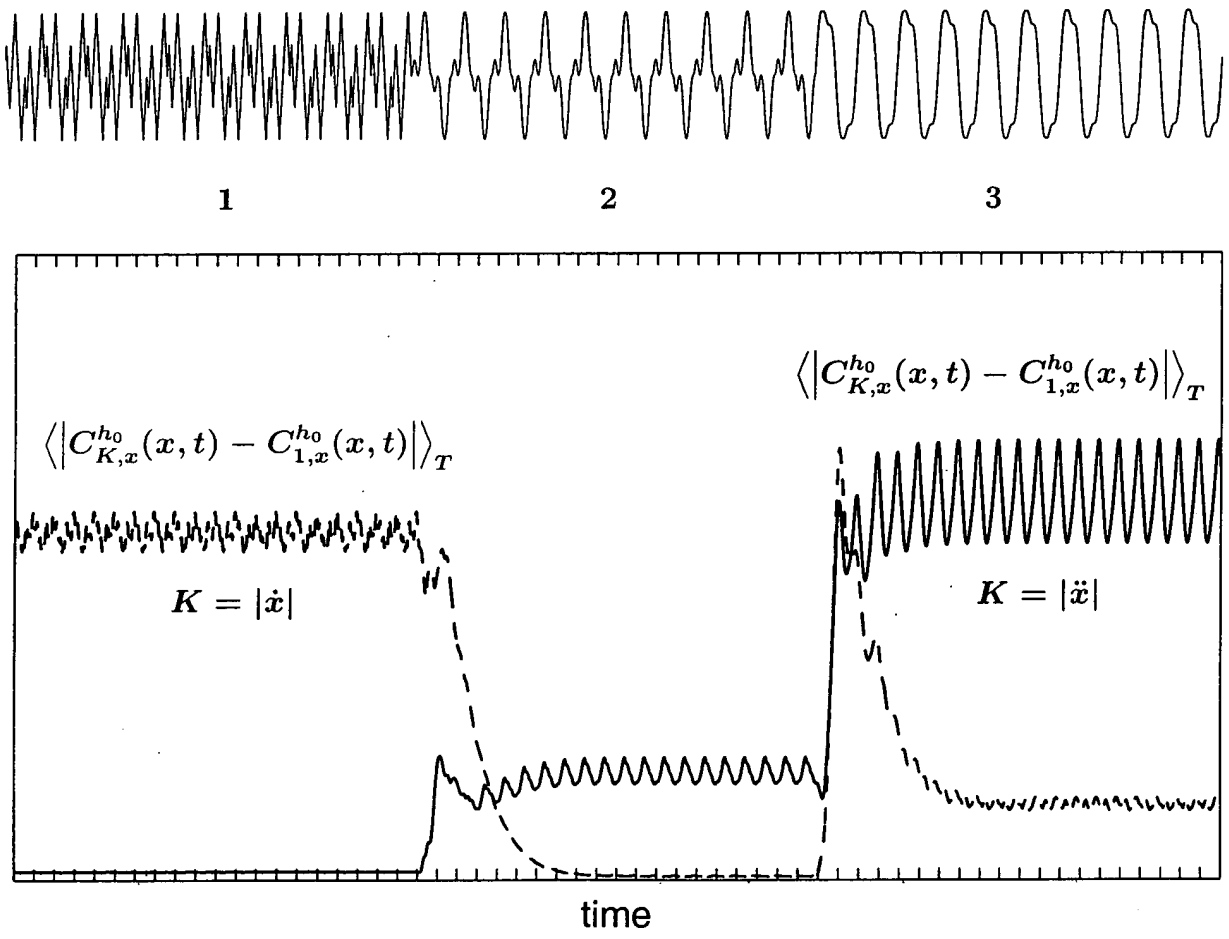



Fig. 32

09215224 - 080301

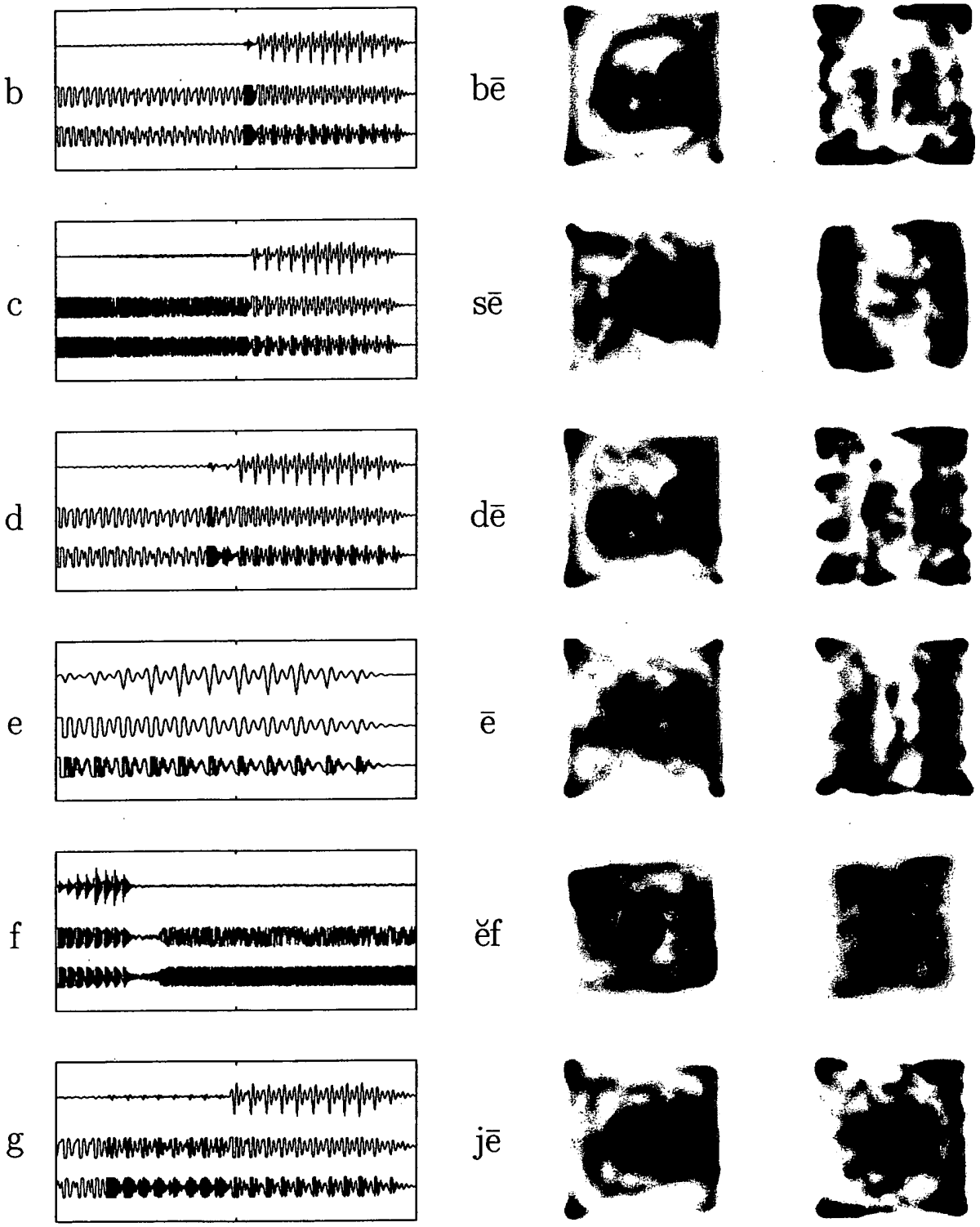



Fig. 33

PCT/US2004/025490

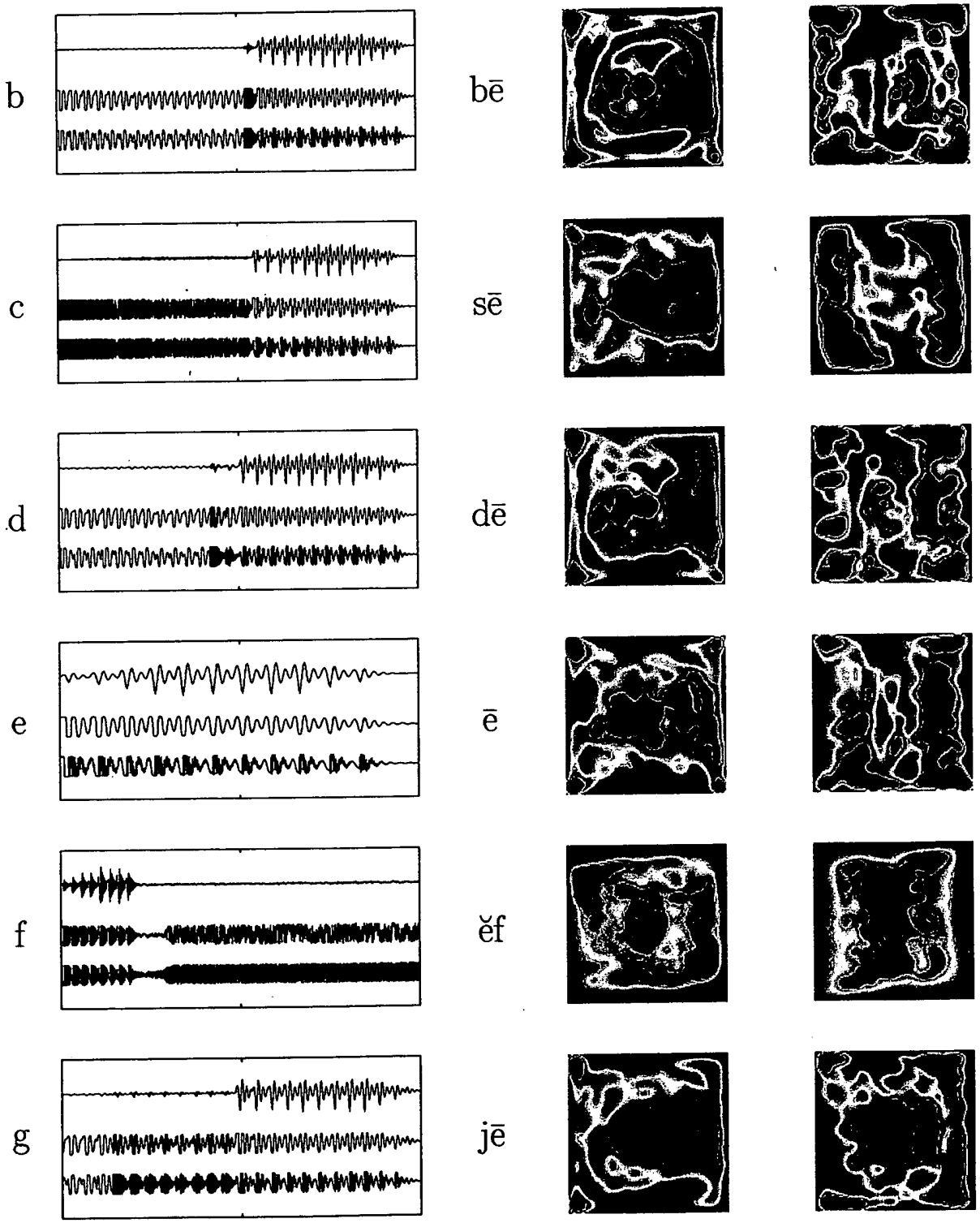



Fig. 33

PCT/US2004/015454 - 04.10.2005

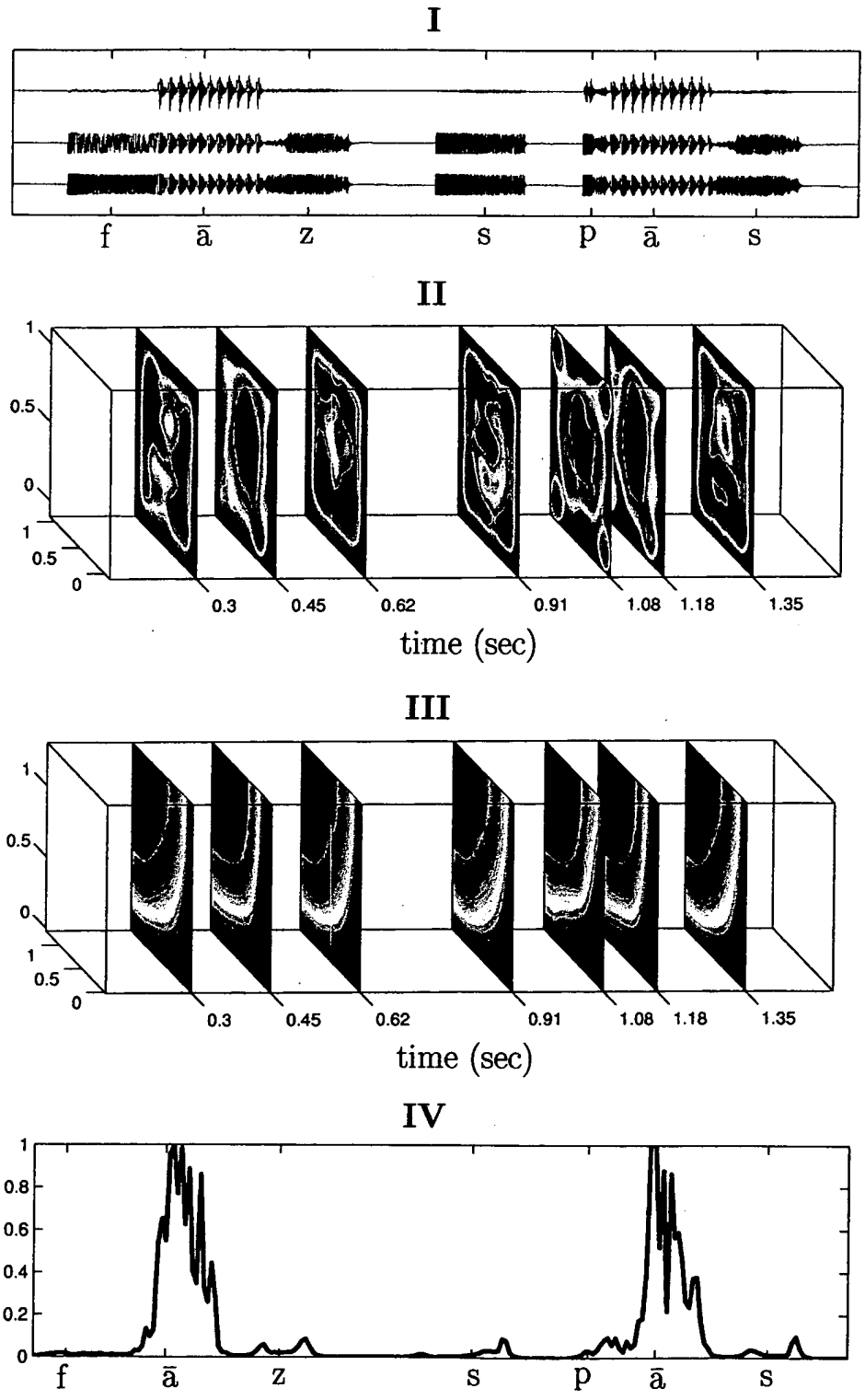
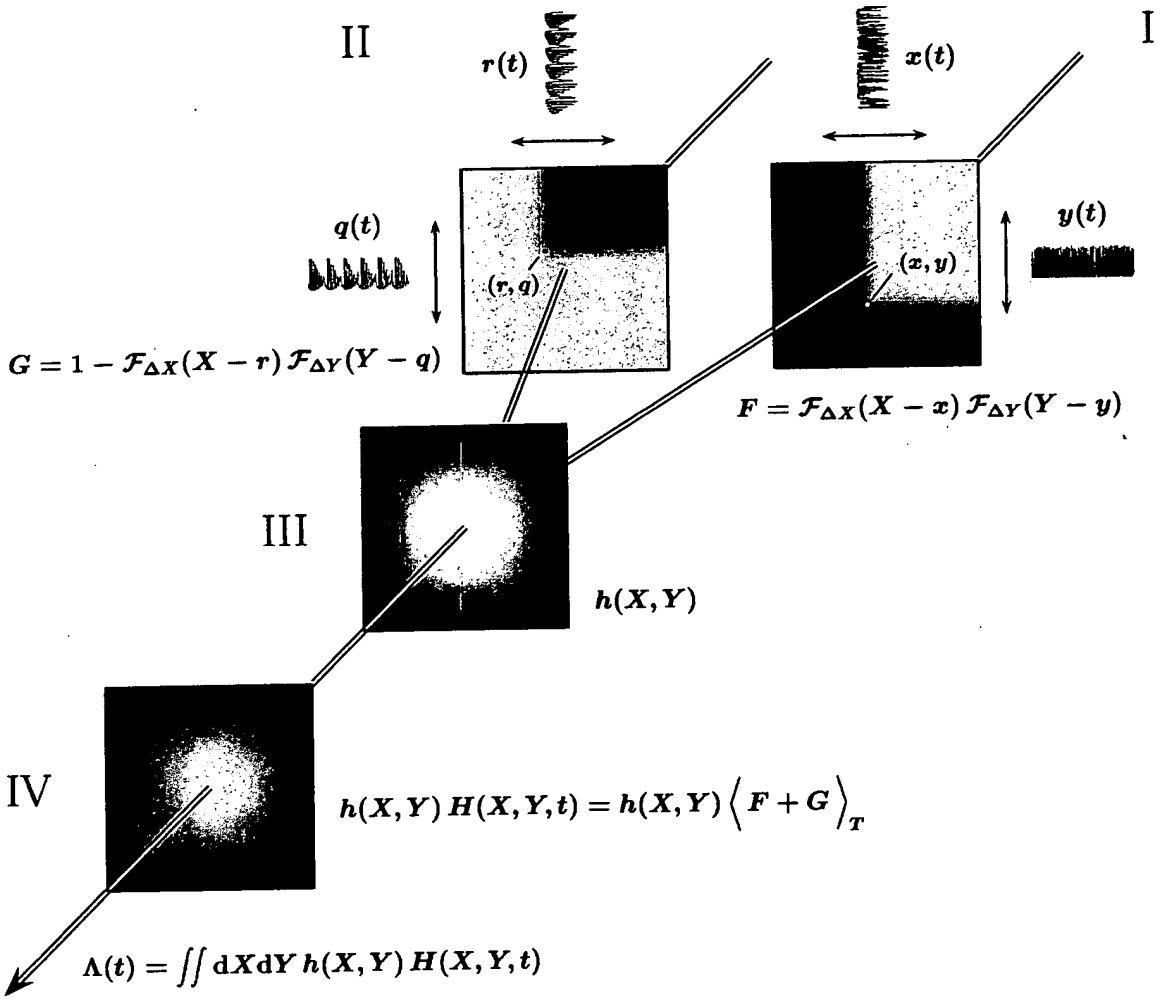



Fig. 34

EL388608922US



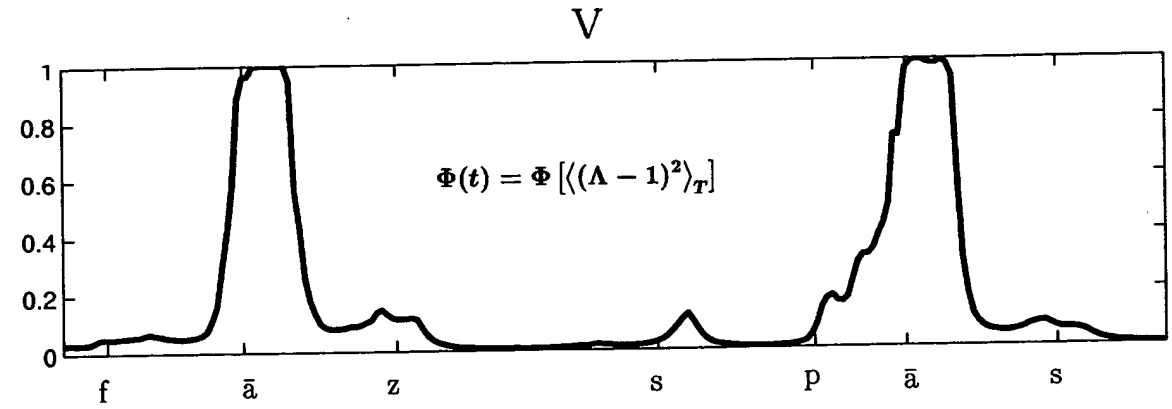




Fig. 35

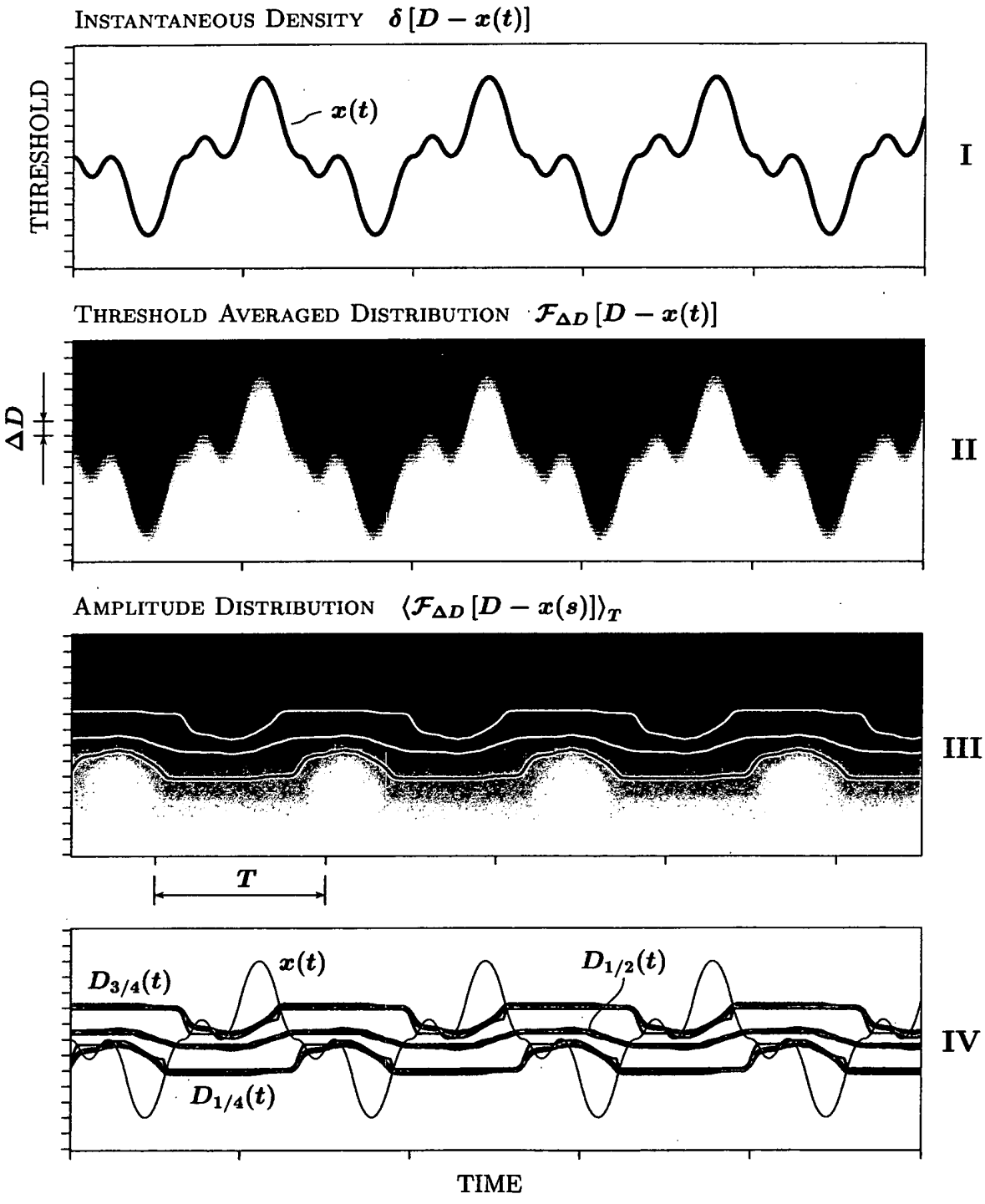

INSTANTANEOUS DENSITY $\delta[D - x(t)]$
THRESHOLD
$x(t)$
I
THRESHOLD AVERAGED DISTRIBUTION $\mathcal{F}_{\Delta D}[D - x(t)]$
$\Delta D$
II
AMPLITUDE DISTRIBUTION $\langle \mathcal{F}_{\Delta D}[D - x(s)] \rangle_T$
III
$T$
$D_{3/4}(t)$
$x(t)$
$D_{1/2}(t)$
$D_{1/4}(t)$
IV
TIME

Fig. 36

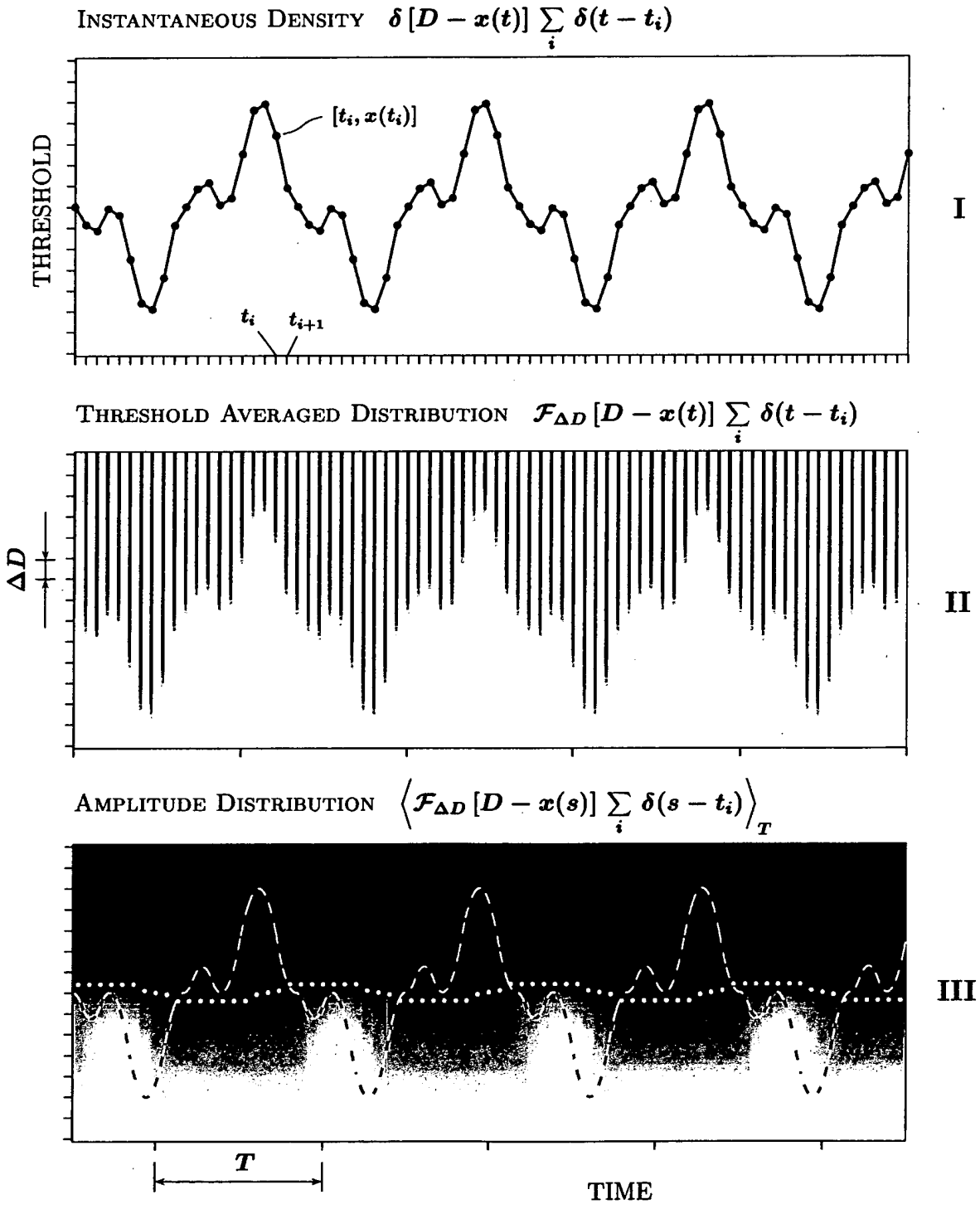

INSTANTANEOUS DENSITY $\delta[D-x(t)]\sum_i \delta(t-t_i)$
THRESHOLD
$[t_i, x(t_i)]$
$t_i$
$t_{i+1}$
I
THRESHOLD AVERAGED DISTRIBUTION $\mathcal{F}_{\Delta D}[D-x(t)]\sum_i \delta(t-t_i)$
$\Delta D$
II
AMPLITUDE DISTRIBUTION $\left\langle \mathcal{F}_{\Delta D}[D-x(s)]\sum_i \delta(s-t_i)\right\rangle_T$
III
$T$
TIME

Fig. 37

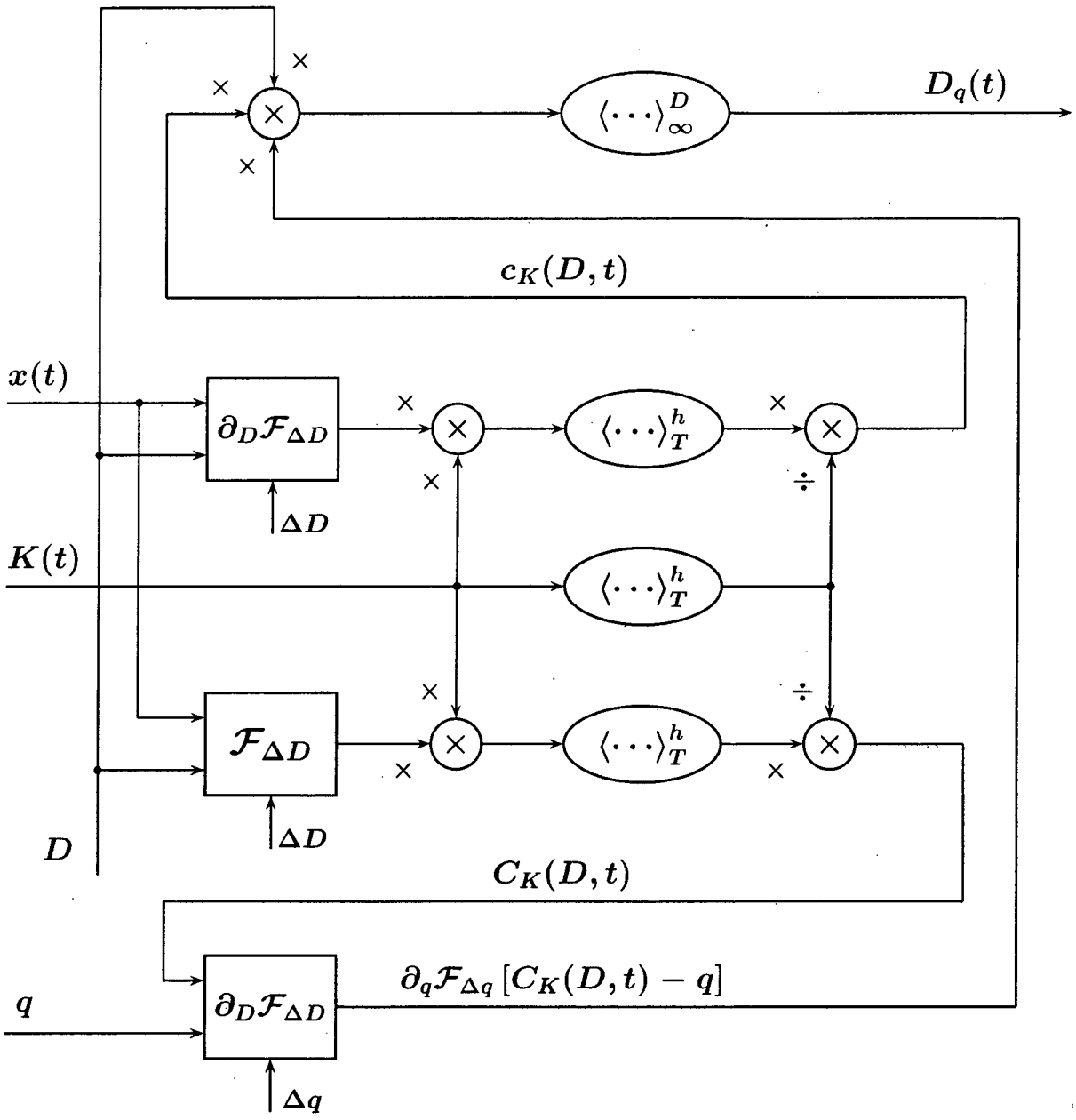

$D_q(t)$
$\langle\cdots\rangle_\infty^D$
$c_K(D,t)$
$x(t)$
$\partial_D \mathcal{F}_{\Delta D}$
$\Delta D$
$\langle\cdots\rangle_T^h$
$K(t)$
$\mathcal{F}_{\Delta D}$
$D$
$C_K(D,t)$
$\partial_q \mathcal{F}_{\Delta q}\,[C_K(D,t) - q]$
$q$
$\partial_D \mathcal{F}_{\Delta D}$
$\Delta q$

Fig. 38

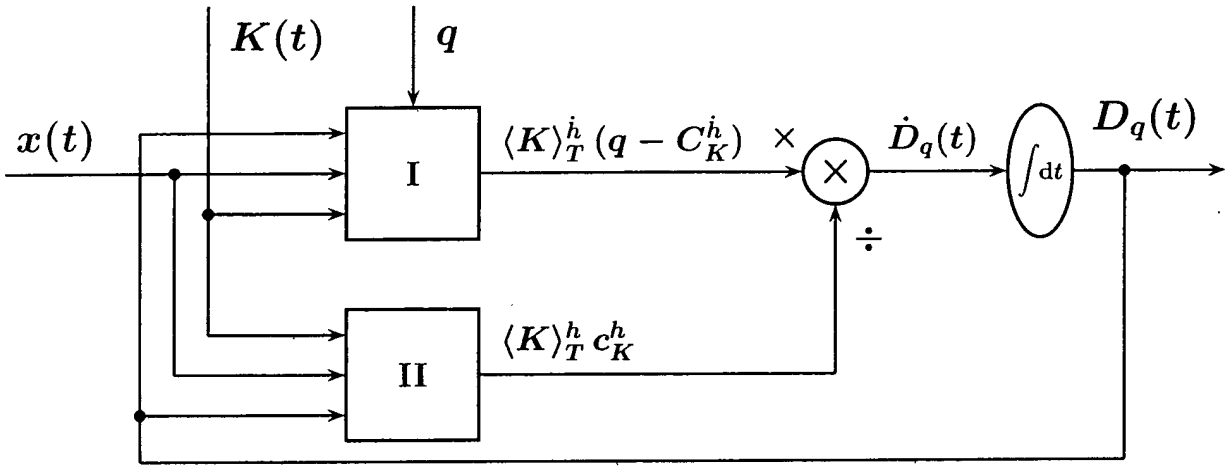



Fig. 39

09245204.080304

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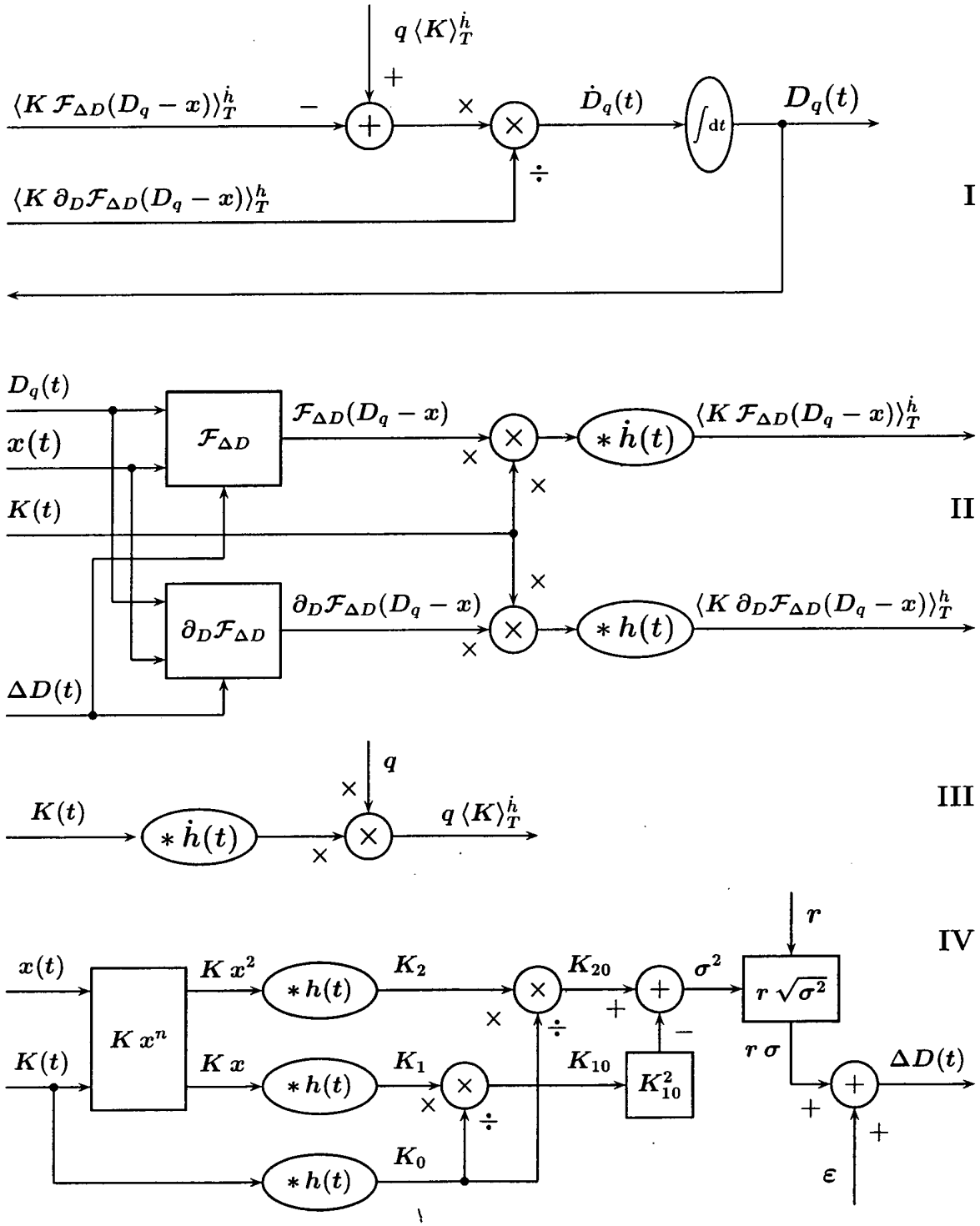



Fig. 40

EL388608922US

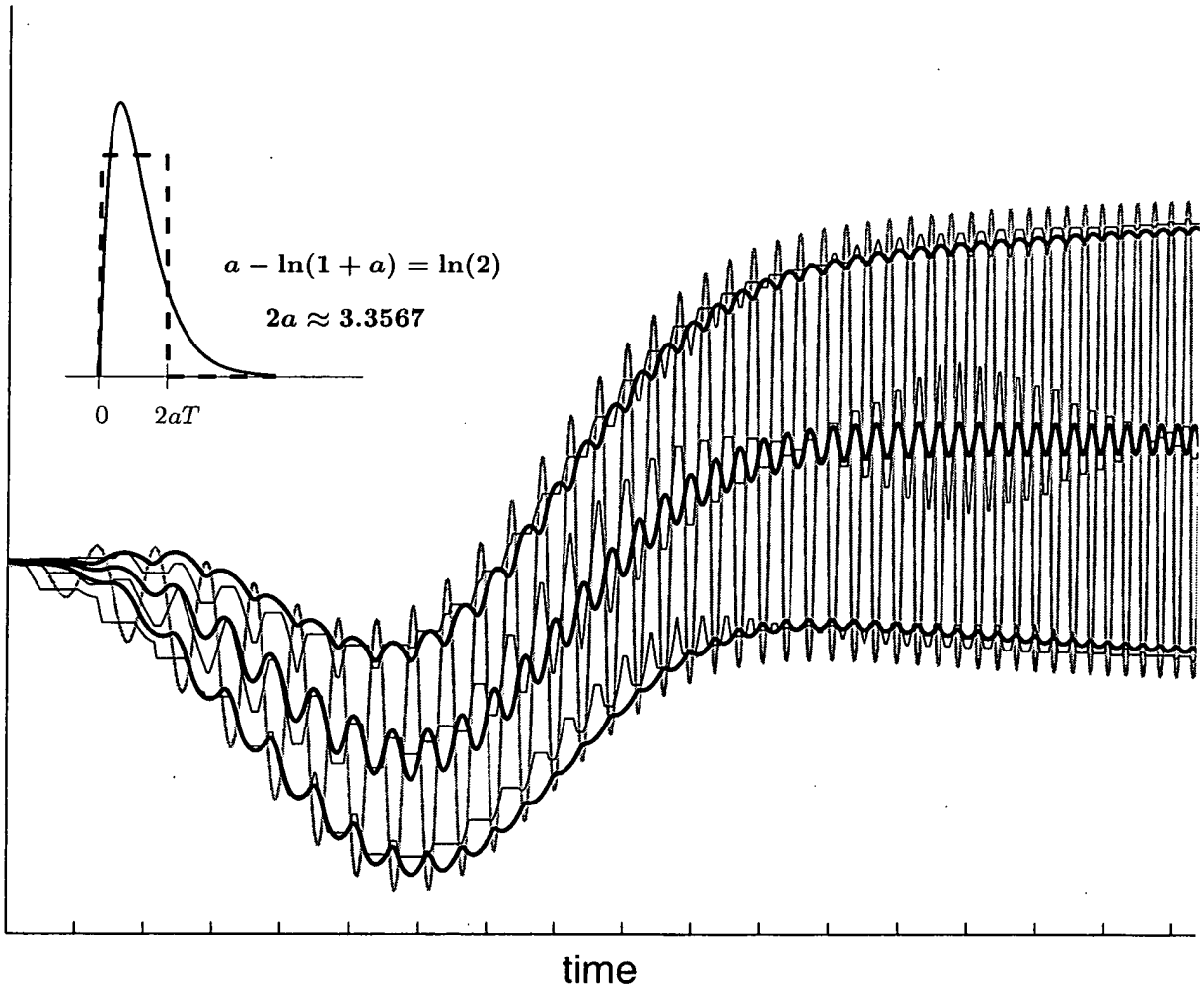



Fig. 41

EL388608922US

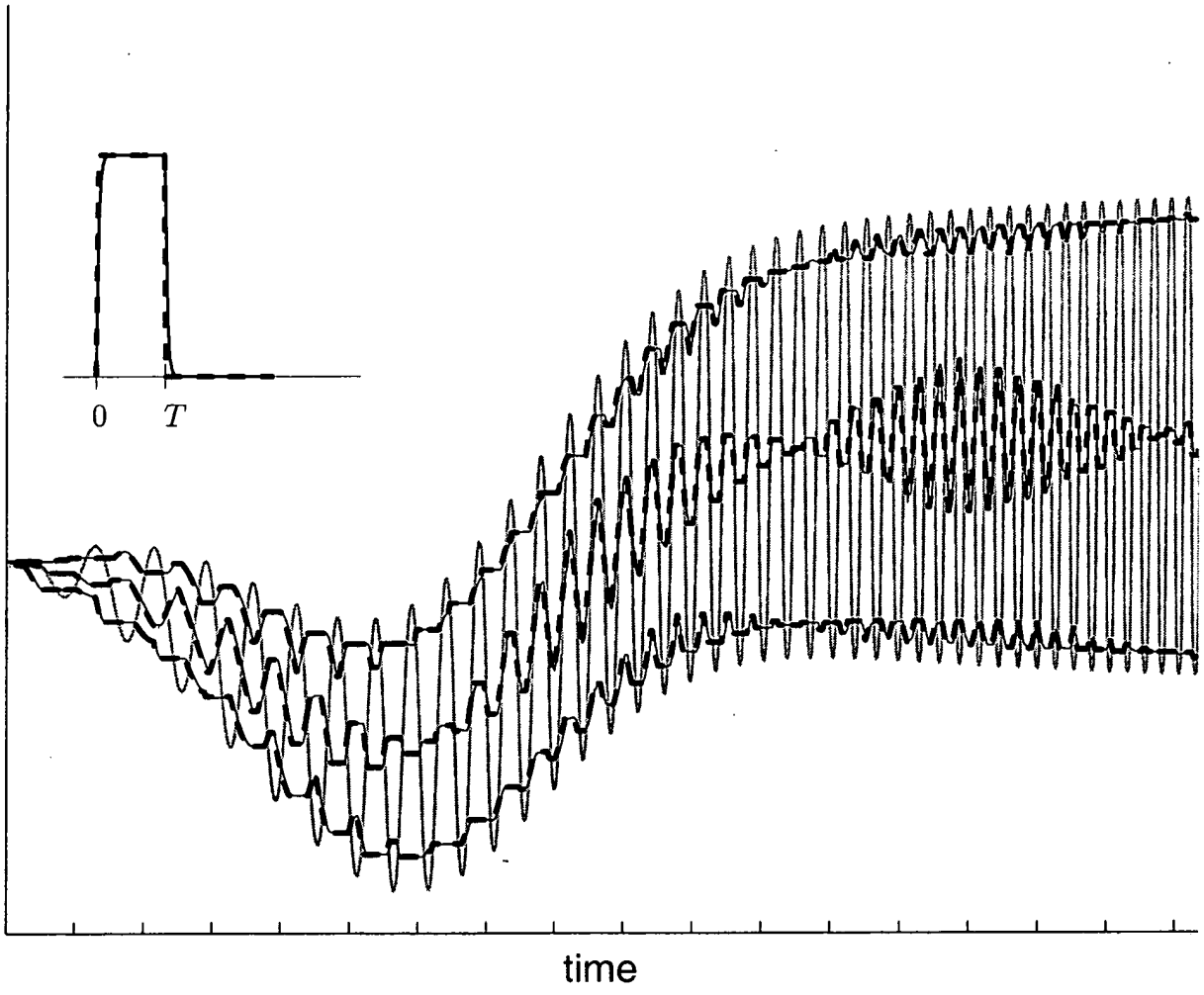



Fig. 42

FOR 60 "PATENT"

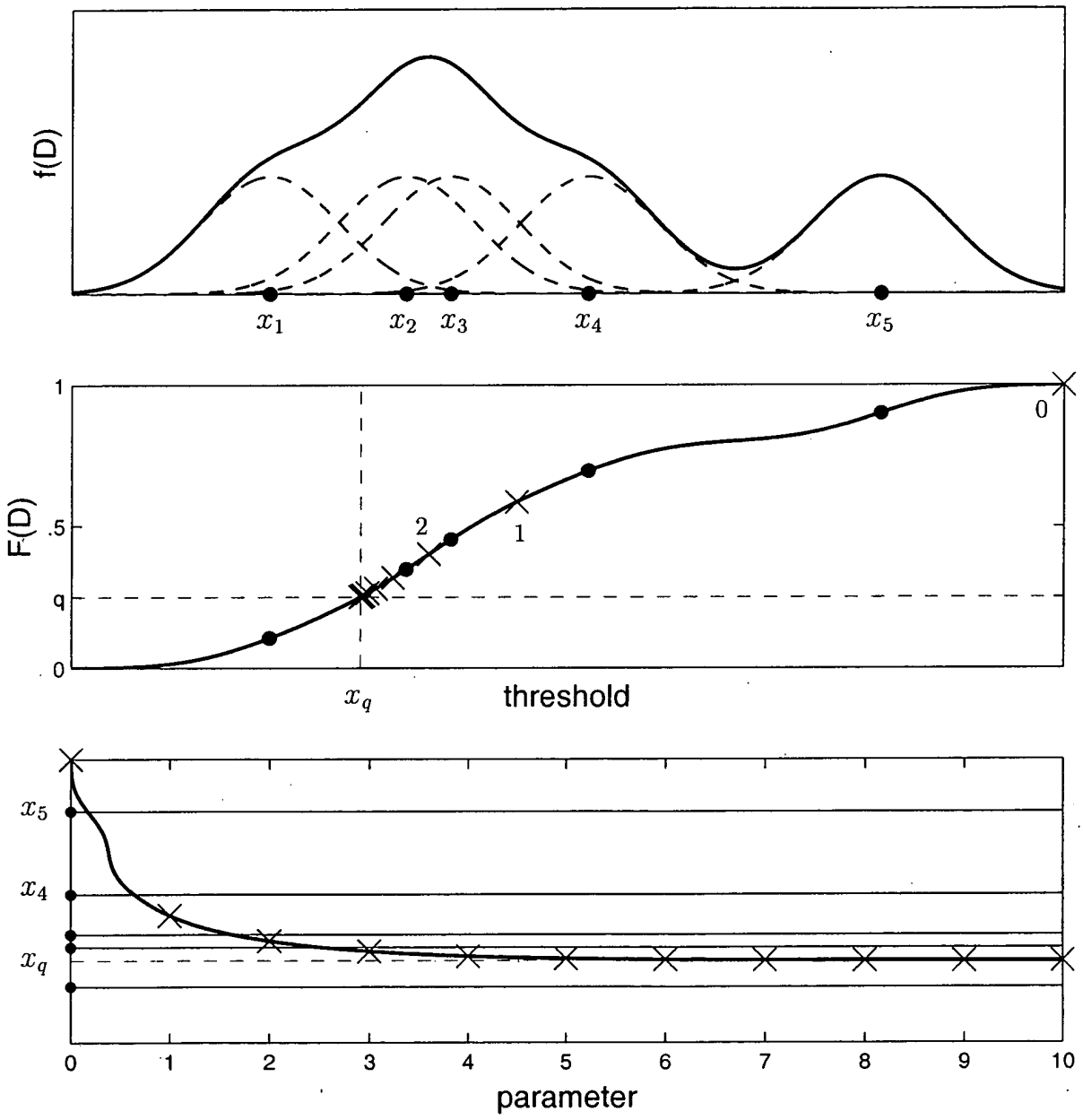
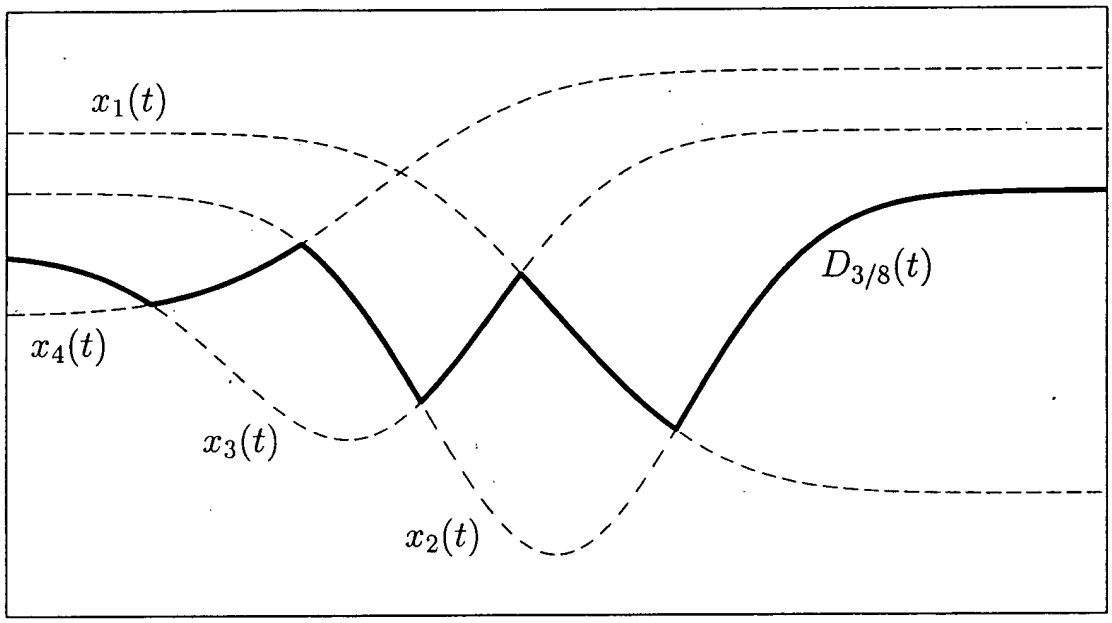



Fig. 43

EL388608922US

I




II

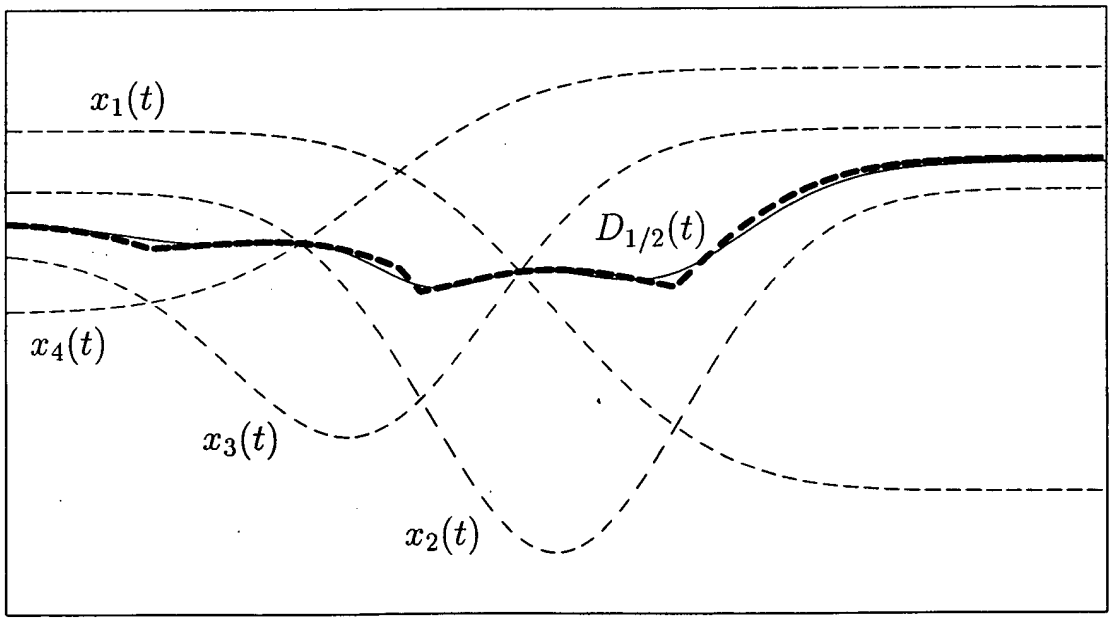



Fig. 44

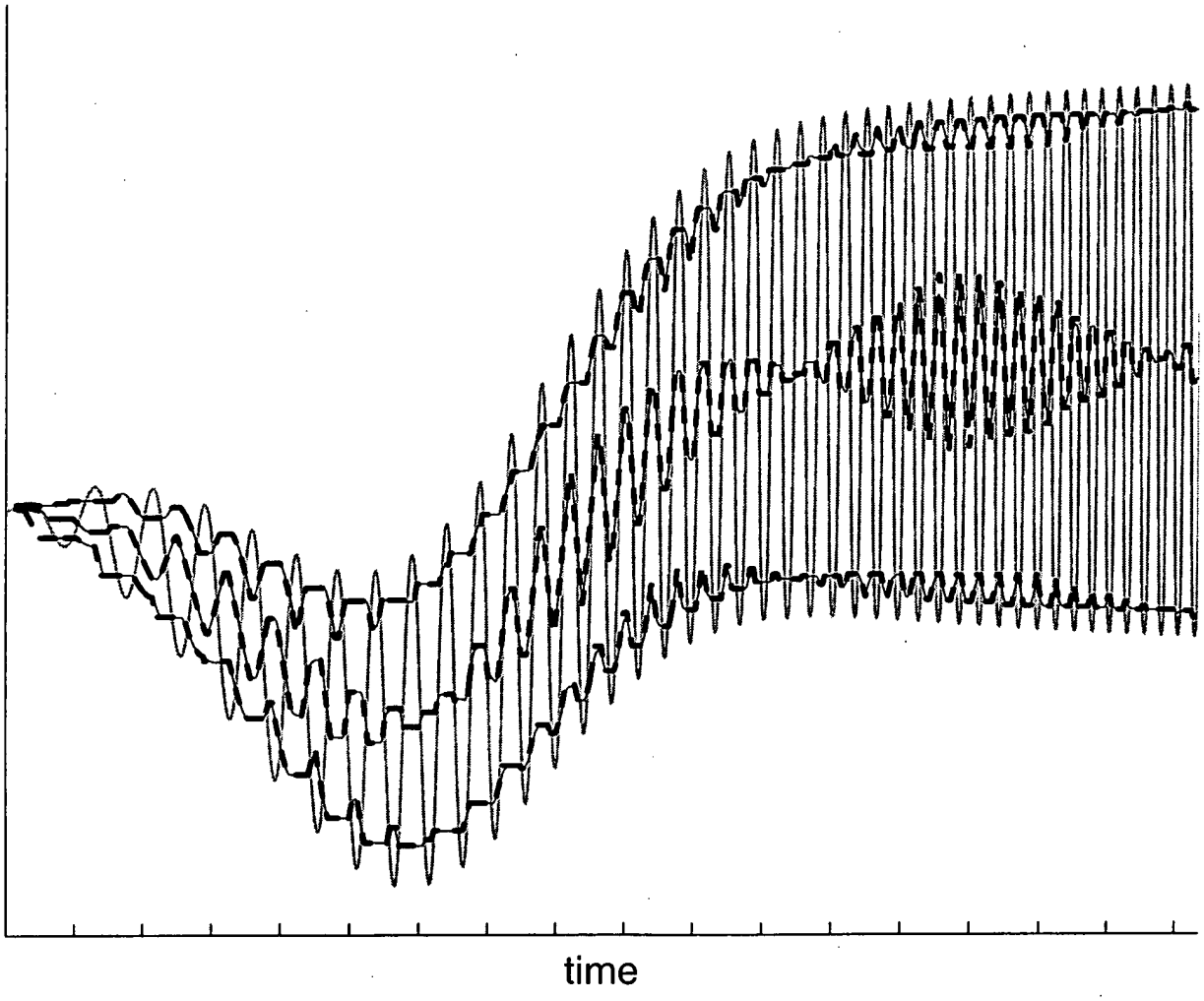



Fig. 45

PCT/US2004/008054

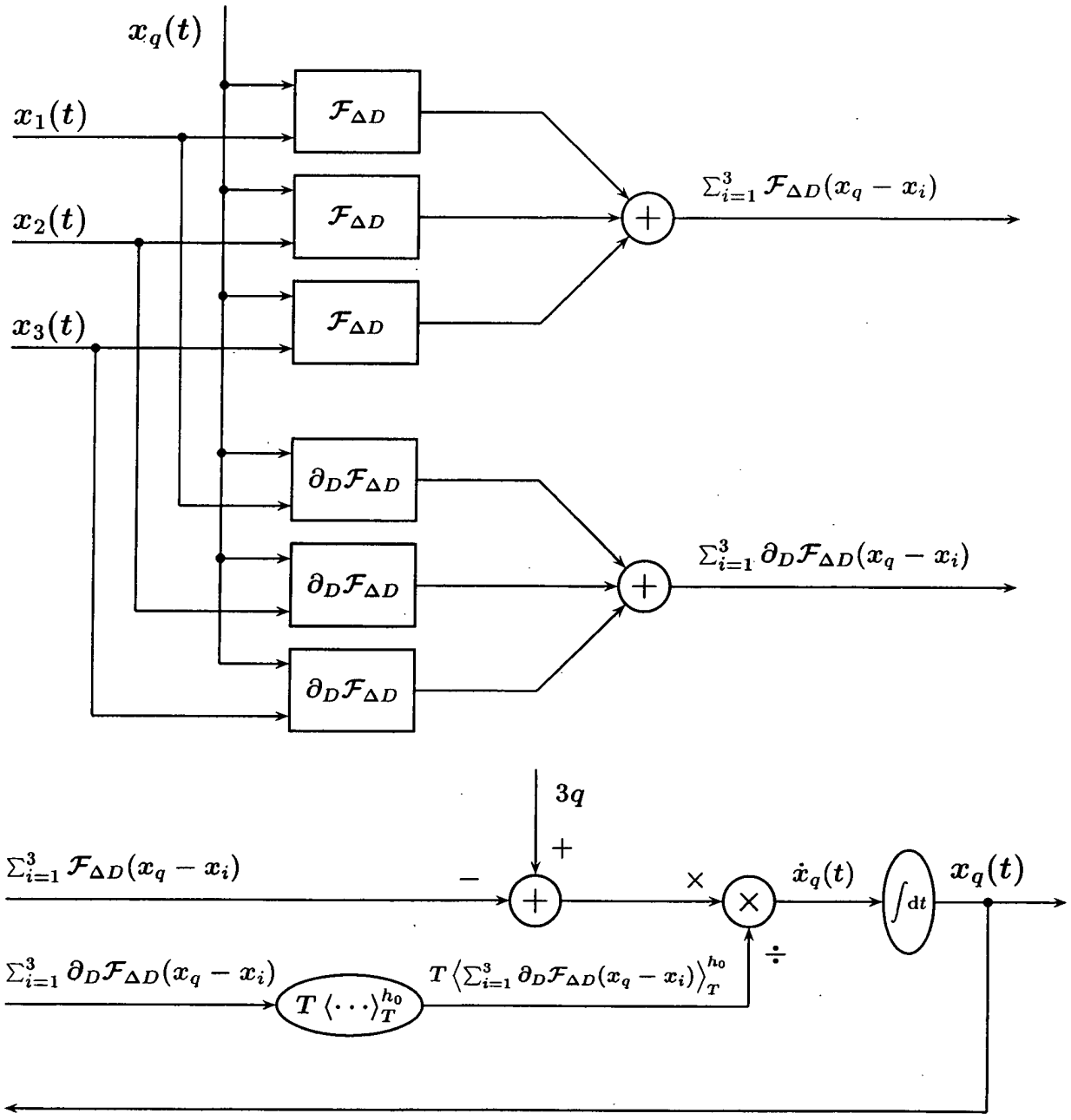



Fig. 46

TECHNOLOGY PATENT

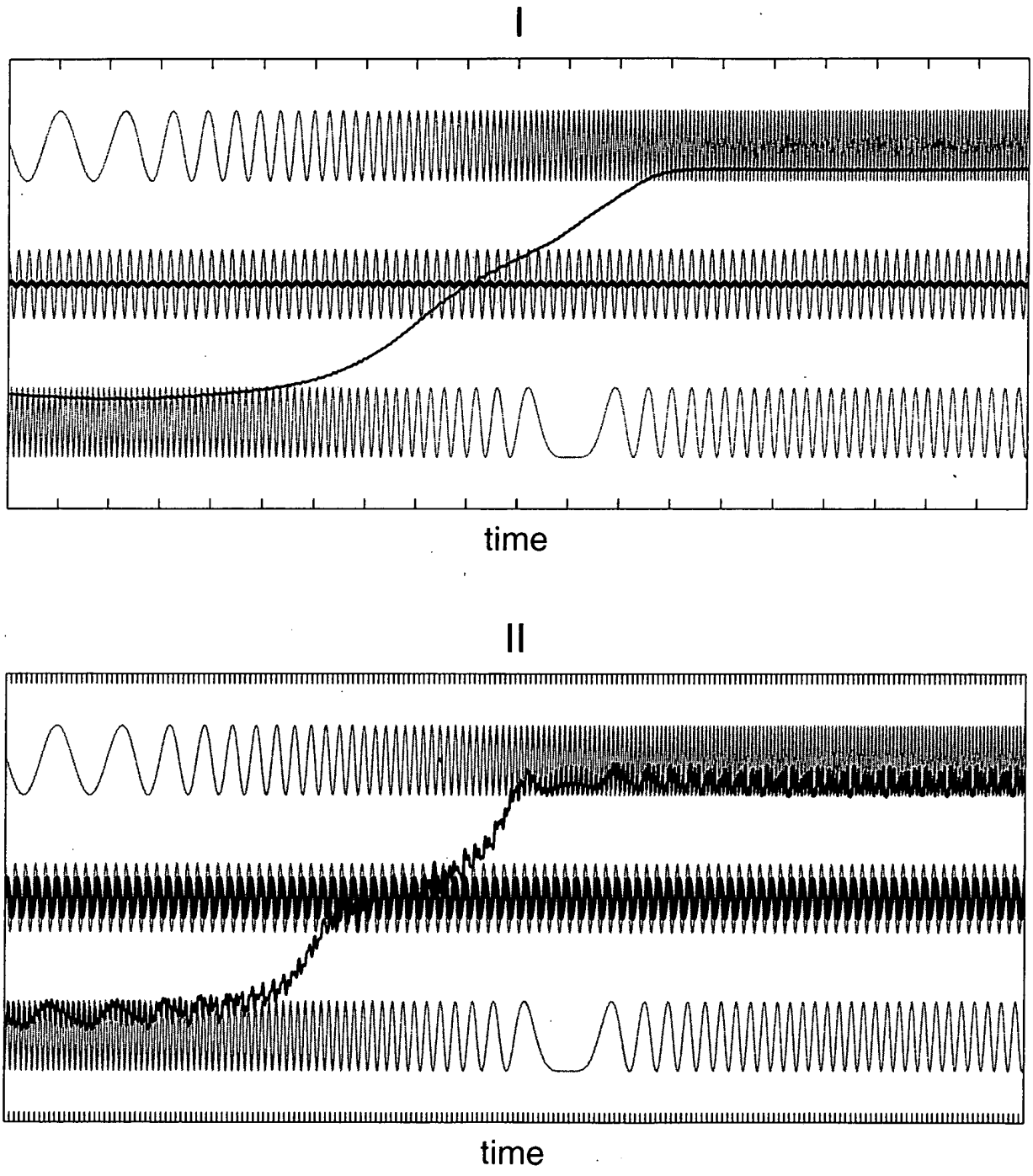
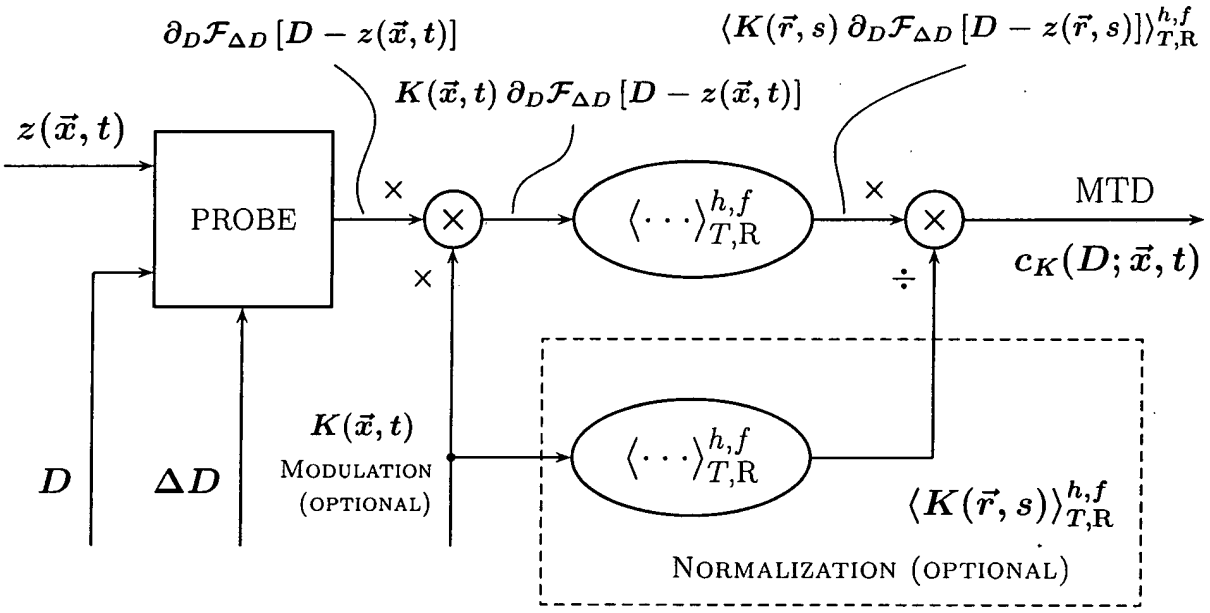



Fig. 47

Docket #15252.2

## MTD FOR SCALAR FIELD




ACQUISITION SYSTEM: MEASURING DEVICE (PROBE)
HAS INPUT-OUTPUT CHARACTERISTIC OF DIFFERENTIAL DISCRIMINATOR.

$z(\vec{x},t)$ IS INPUT SCALAR VARIABLE (FIELD). E.G., MONOCHROME 2D-SURFACE (IMAGE) CAN BE VIEWED EITHER AS CONTINUOUS 2D SCALAR FIELD, OR AS DISCRETE ENSEMBLE OF VARIABLES.

$D$ AND $\Delta D$ ARE PARAMETERS OF PROBE. $D$ IS DISPLACEMENT, OR THRESHOLD. IT IS ANOTHER VARIABLE (NORMALLY OF SAME NATURE AS INPUT VARIABLE), SERVING AS UNIT, OR DATUM. $\Delta D$ IS WIDTH, OR RESOLUTION, PARAMETER OF PROBE.

$K(\vec{x},t)$ IS MODULATING VARIABLE, GENERALLY OF DIFFERENT NATURE THAN INPUT VARIABLE. E.G., $K(\vec{x},t)$.= constant LEADS TO MTD AS AMPLITUDE DENSITY, AND $K(\vec{x},t) = |\dot{z}(\vec{x},t)|$ LEADS TO MTD AS COUNTING DENSITY/RATE.

Fig. 48

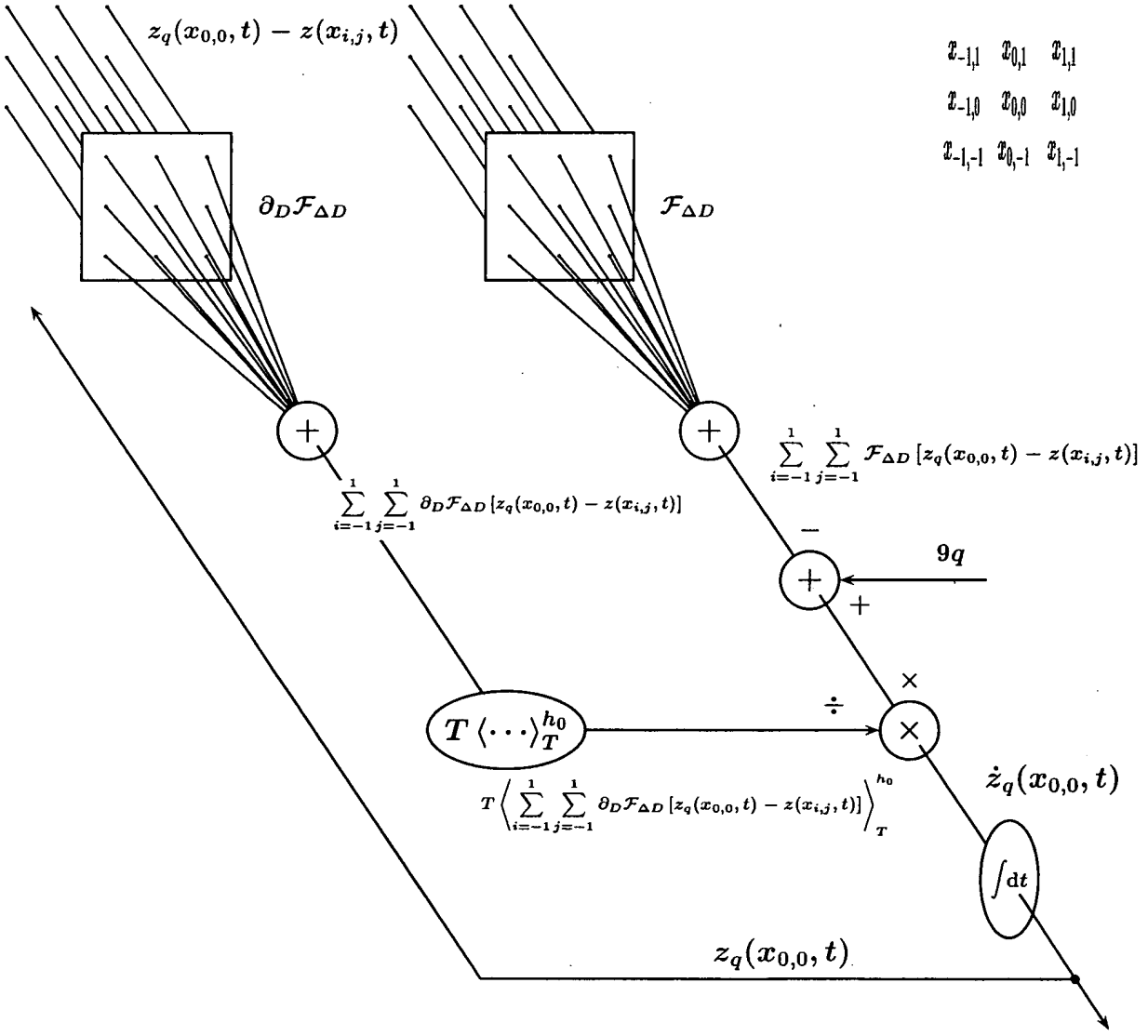

$z_q(x_{0,0},t) - z(x_{i,j},t)$
$\partial_D \mathcal{F}_{\Delta D}$
$\mathcal{F}_{\Delta D}$
$\mathcal{I}_{-1,1}$ $\mathcal{I}_{0,1}$ $\mathcal{I}_{1,1}$
$\mathcal{I}_{-1,0}$ $\mathcal{I}_{0,0}$ $\mathcal{I}_{1,0}$
$\mathcal{I}_{-1,-1}$ $\mathcal{I}_{0,-1}$ $\mathcal{I}_{1,-1}$
$\sum_{i=-1}^{1}\sum_{j=-1}^{1} \partial_D \mathcal{F}_{\Delta D}[z_q(x_{0,0},t) - z(x_{i,j},t)]$
$\sum_{i=-1}^{1}\sum_{j=-1}^{1} \mathcal{F}_{\Delta D}[z_q(x_{0,0},t) - z(x_{i,j},t)]$
9q
$T\langle\cdots\rangle_T^{h_0}$
$T\left\langle \sum_{i=-1}^{1}\sum_{j=-1}^{1} \partial_D \mathcal{F}_{\Delta D}[z_q(x_{0,0},t) - z(x_{i,j},t)] \right\rangle_T^{h_0}$
$\dot{z}_q(x_{0,0},t)$
$\int dt$
$z_q(x_{0,0},t)$

Fig. 49

09052524 050304

1



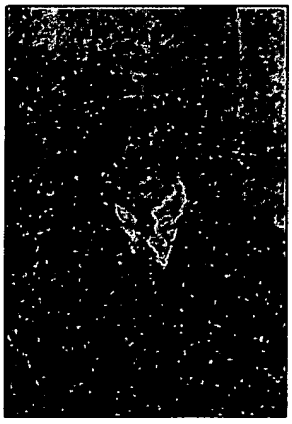
2



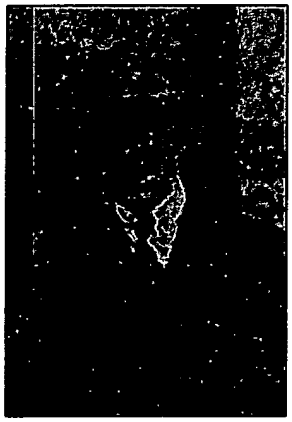
3a $(n = 0)$



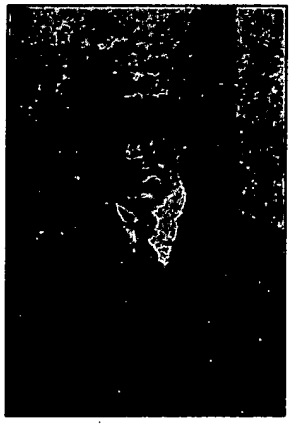
3b $(n = N)$



3c $(n = 2N)$



3d $(n = 3N)$



3e $(n = 4N)$



3f $(n = 6N)$



3g $(n = 10N)$



Fig. 50

DECEMBER 26, 2003 15:24 0802 1524

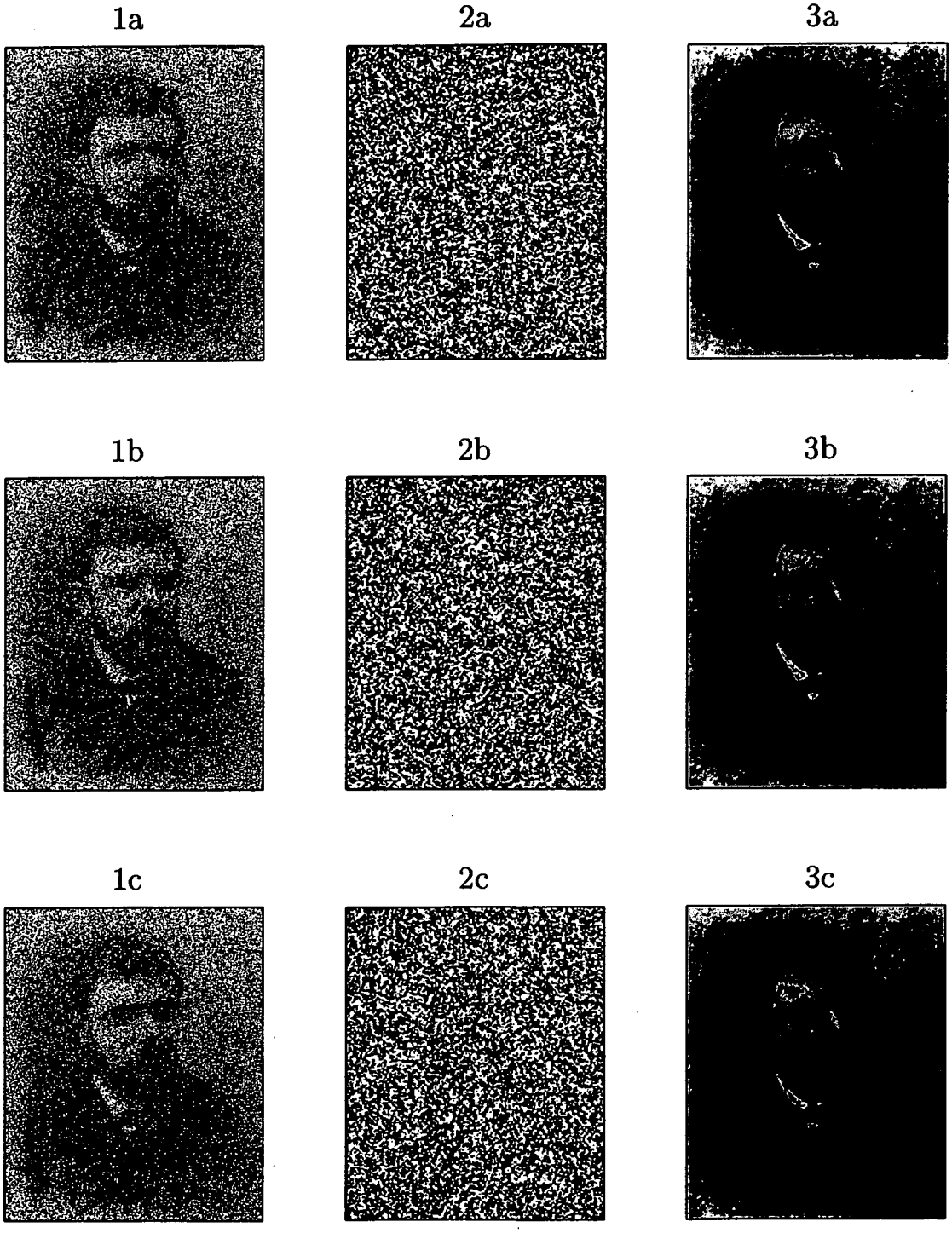
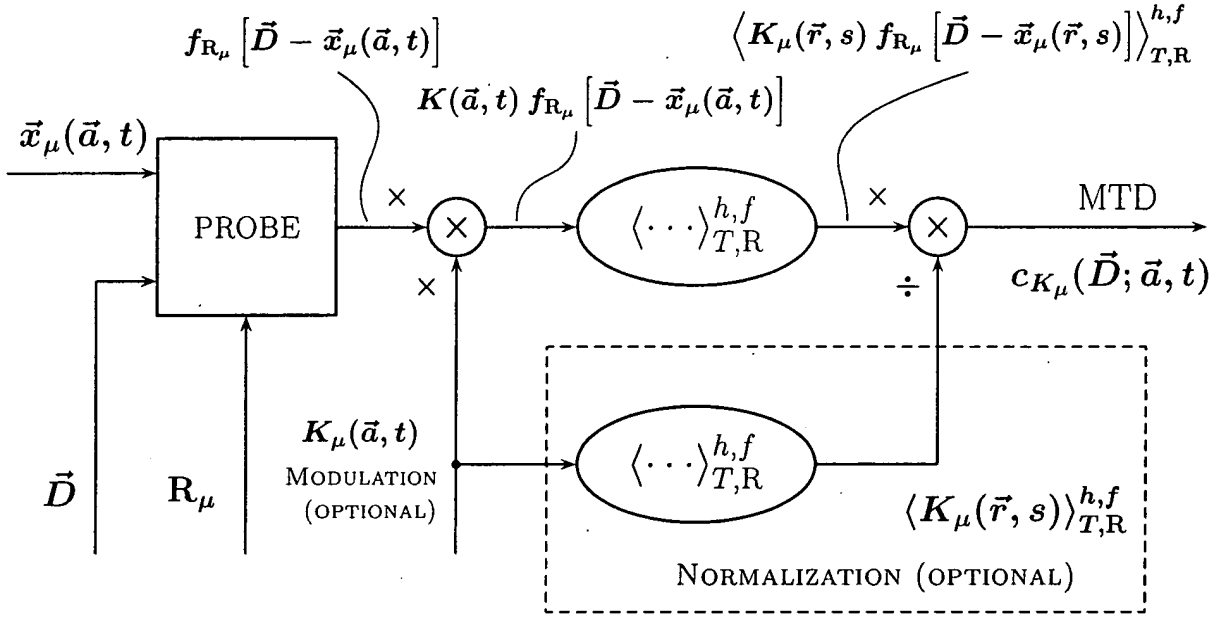



Fig. 51

PROOF: 15252.2 US

## MTD FOR COMPONENT OF ENSEMBLE OF VECTOR FIELDS




ACQUISITION SYSTEM: MEASURING DEVICE (PROBE)
HAS INPUT-OUTPUT CHARACTERISTIC OF DIFFERENTIAL DISCRIMINATOR.

$\vec{x}_\mu(\vec{a},t)$ IS INPUT VECTOR VARIABLE (FIELD). E.G., TRUECOLOR IMAGE CAN BE VIEWED AS CONTINUOUS 3D VECTOR FIELD (WITH 2D POSITION VECTOR $\vec{a}$).

$\vec{D}$ AND $R_\mu$ ARE PARAMETERS OF PROBE. $\vec{D}$ IS DISPLACEMENT, OR THRESHOLD. IT IS ANOTHER VARIABLE (NORMALLY OF SAME NATURE AS INPUT VARIABLE), SERVING AS UNIT, OR DATUM. $R_\mu$ IS WIDTH, OR RESOLUTION, PARAMETER.

$K_\mu(\vec{a},t)$ IS MODULATING VARIABLE, GENERALLY OF DIFFERENT NATURE THAN INPUT VARIABLE. E.G., $K(\vec{a},t)$ = constant LEADS TO MTD AS AMPLITUDE DENSITY, AND $K_\mu(\vec{a},t) = |\dot{\vec{x}}_\mu(\vec{a},t)|$ LEADS TO MTD AS COUNTING DENSITY/RATE.

Fig. 52

EL388608922US

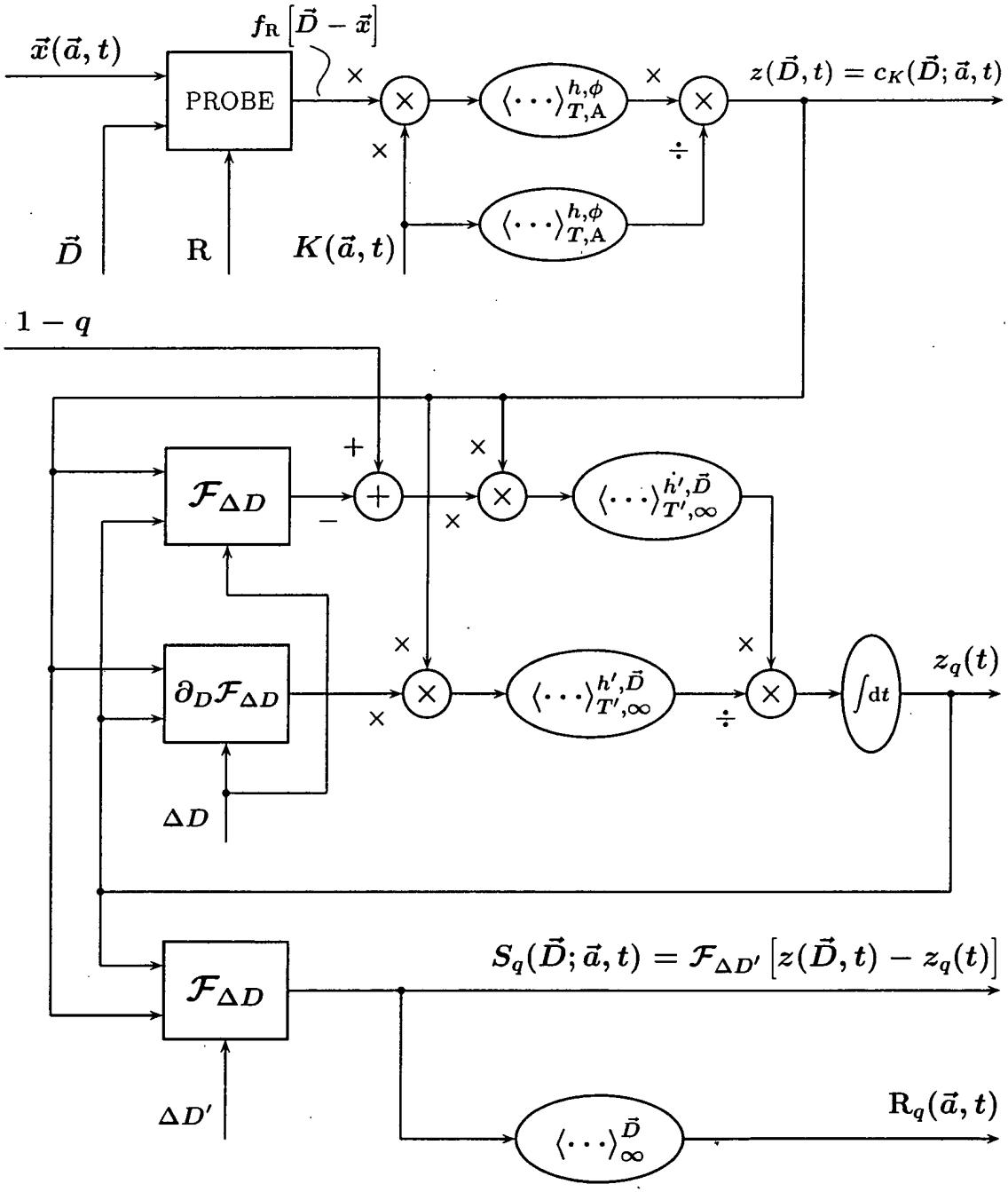



Fig. 53

TOP SECRET

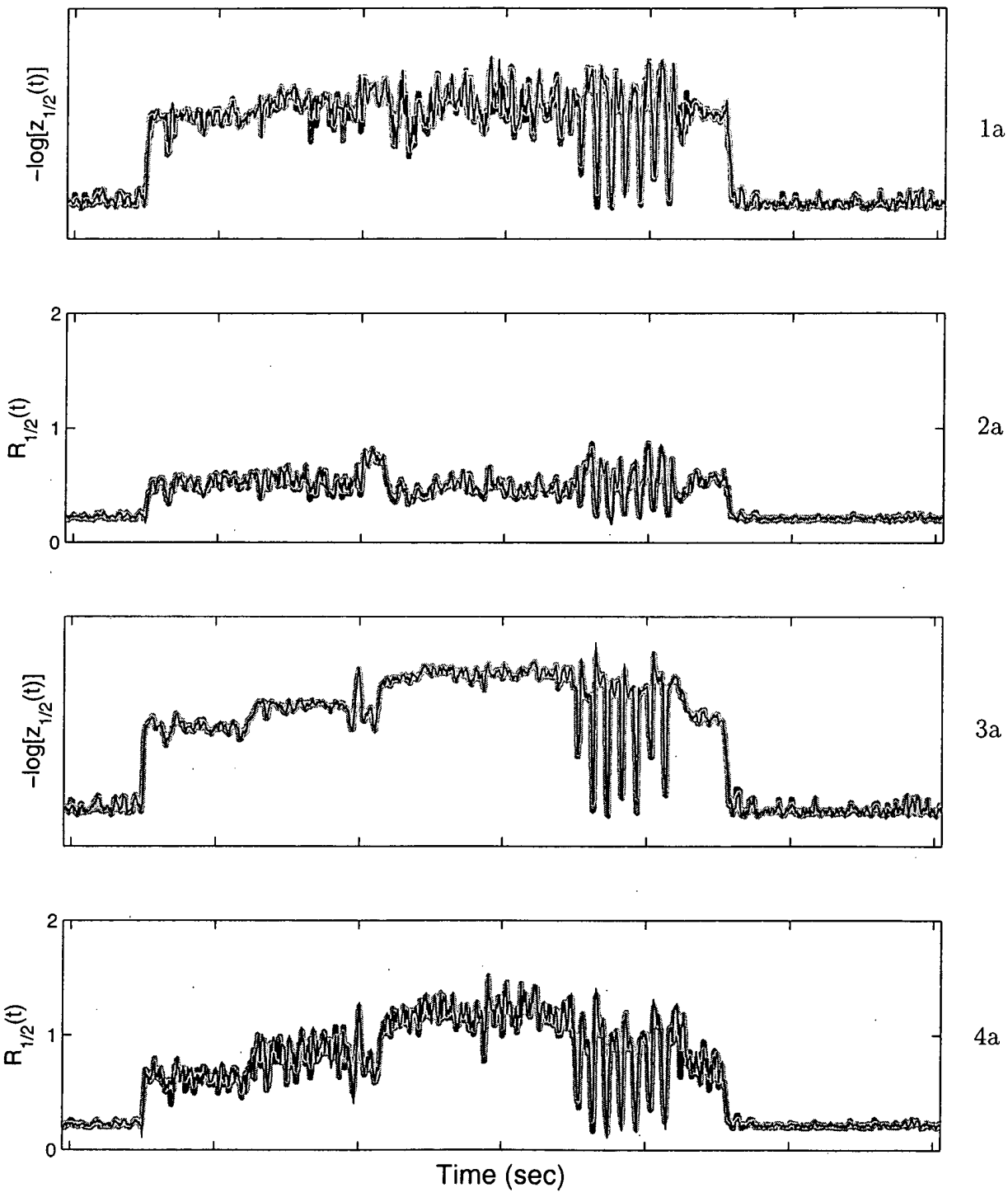



Fig. 54 a

FOE0800 "42526260

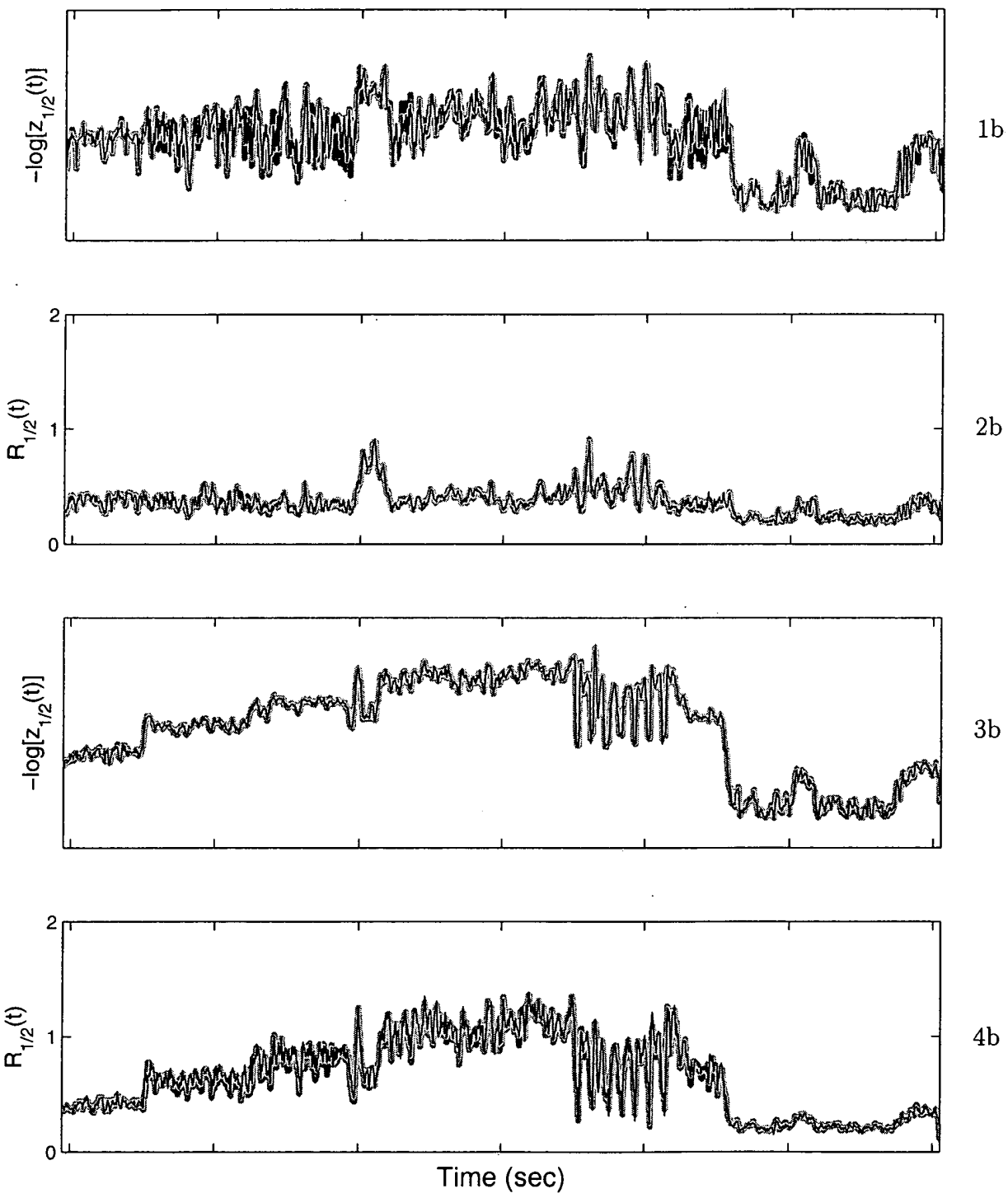



Fig. 54 b

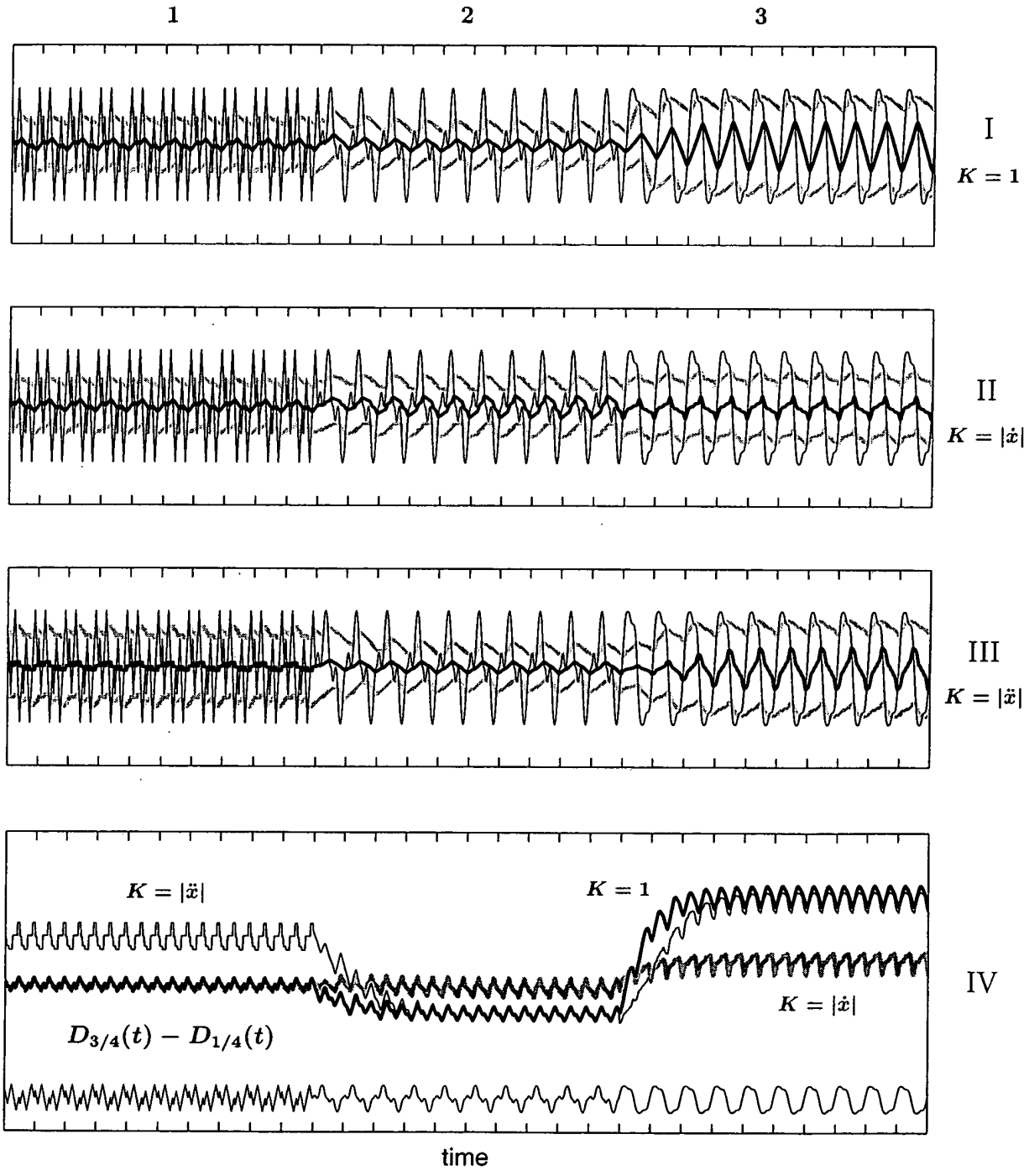



Fig. 55

EL388608922US

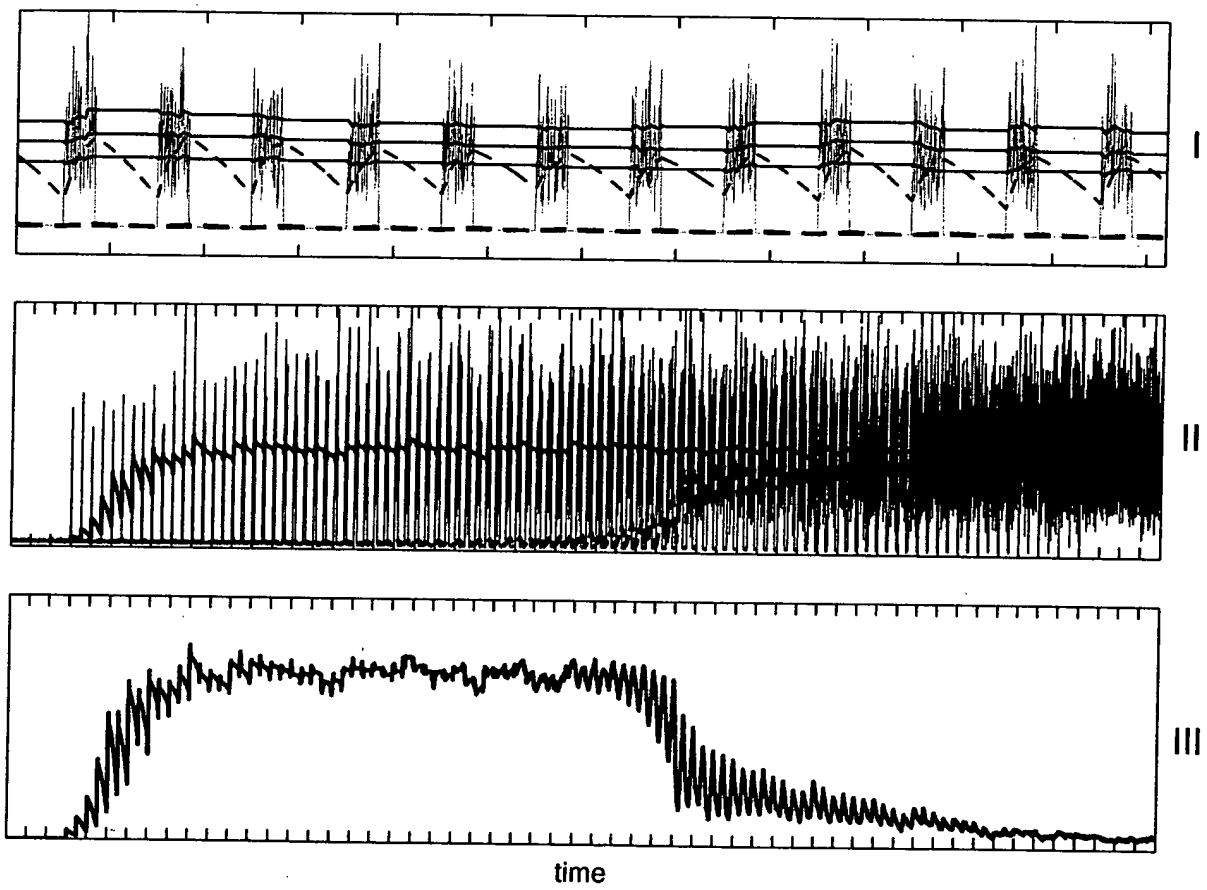



Fig. 56

PCT/US03/08054 08/30/04

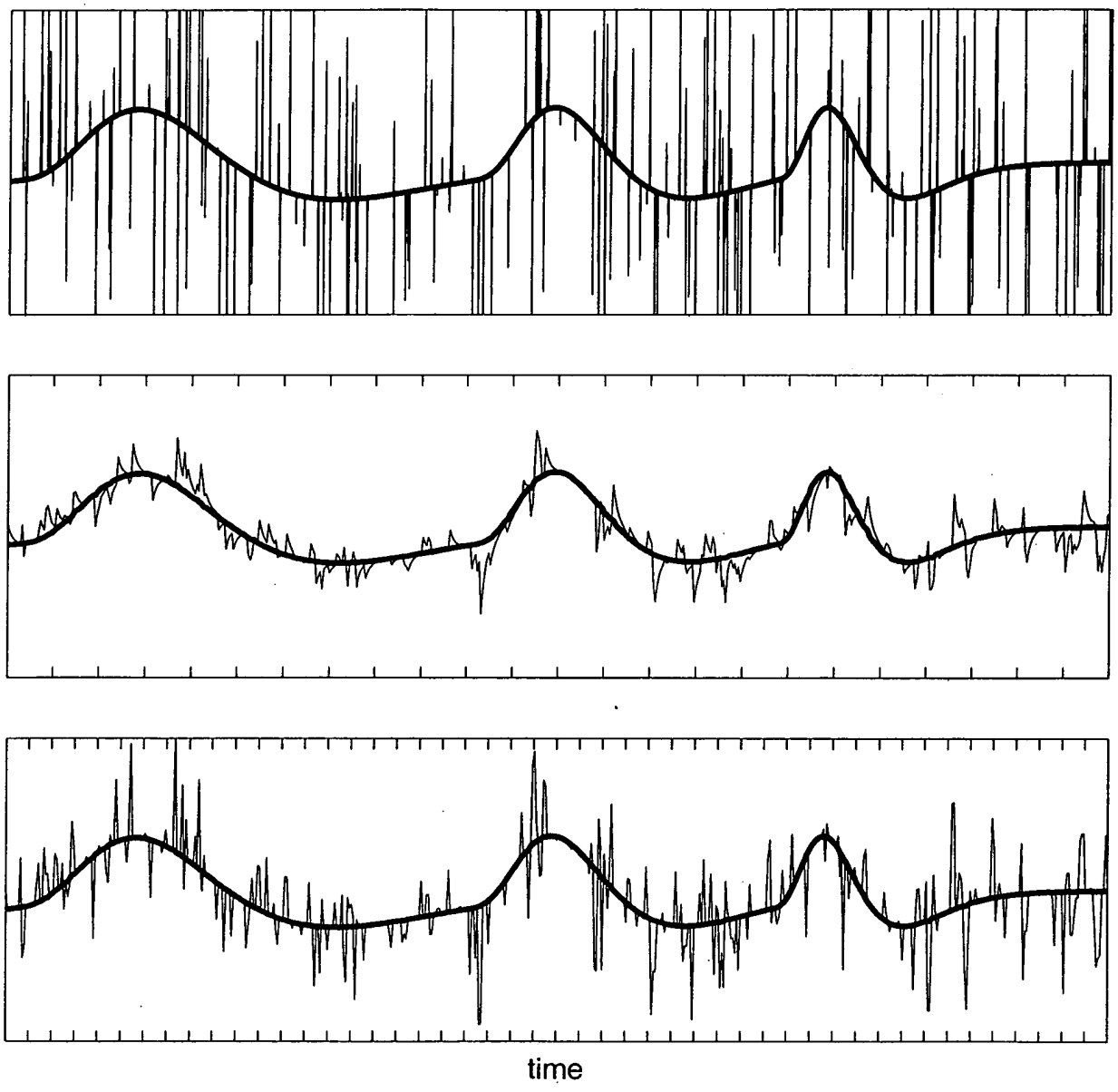



Fig. 57

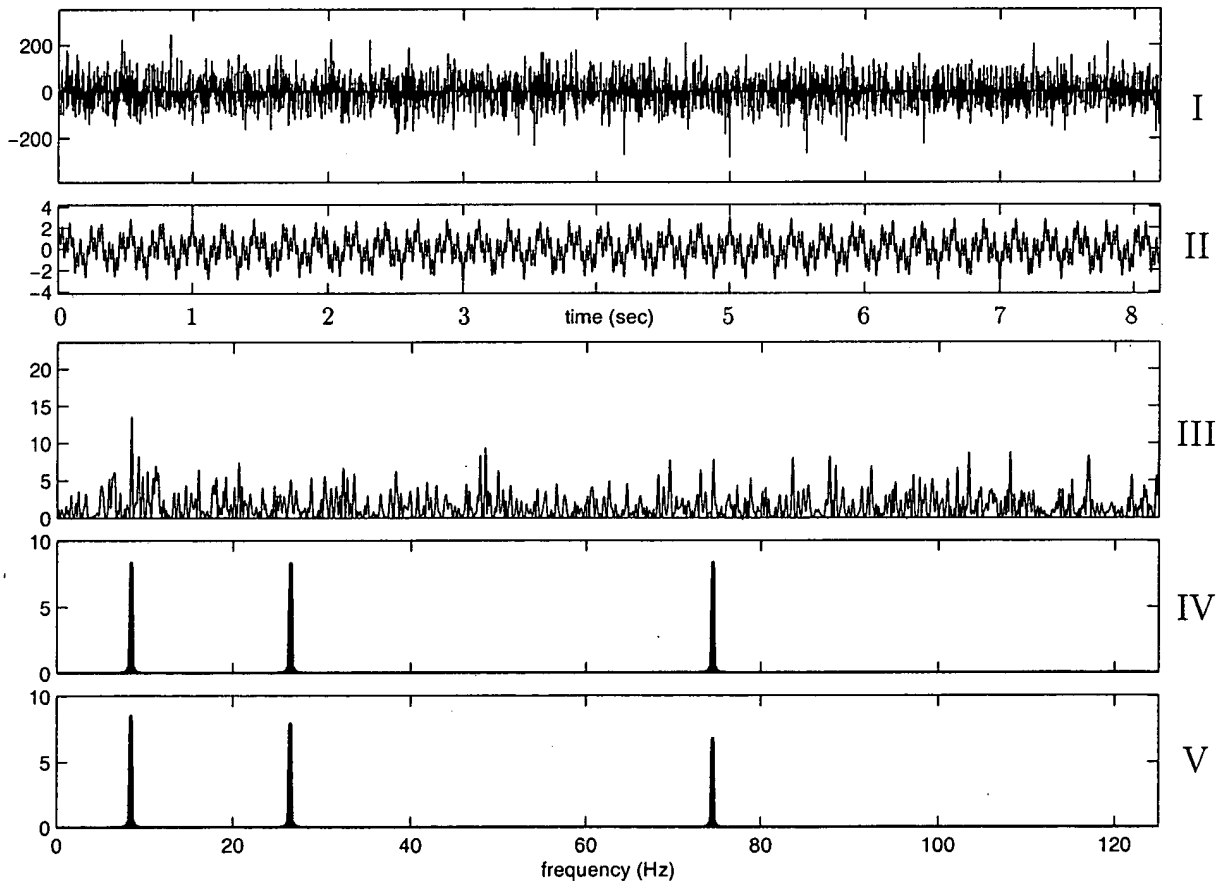

200
0
-200
I
4
2
0
-2
-4
II
0
1
2
3
time (sec)
5
6
7
8
20
15
10
5
0
III
10
5
0
IV
10
5
0
V
0
20
40
60
80
100
120
frequency (Hz)

Fig. 58

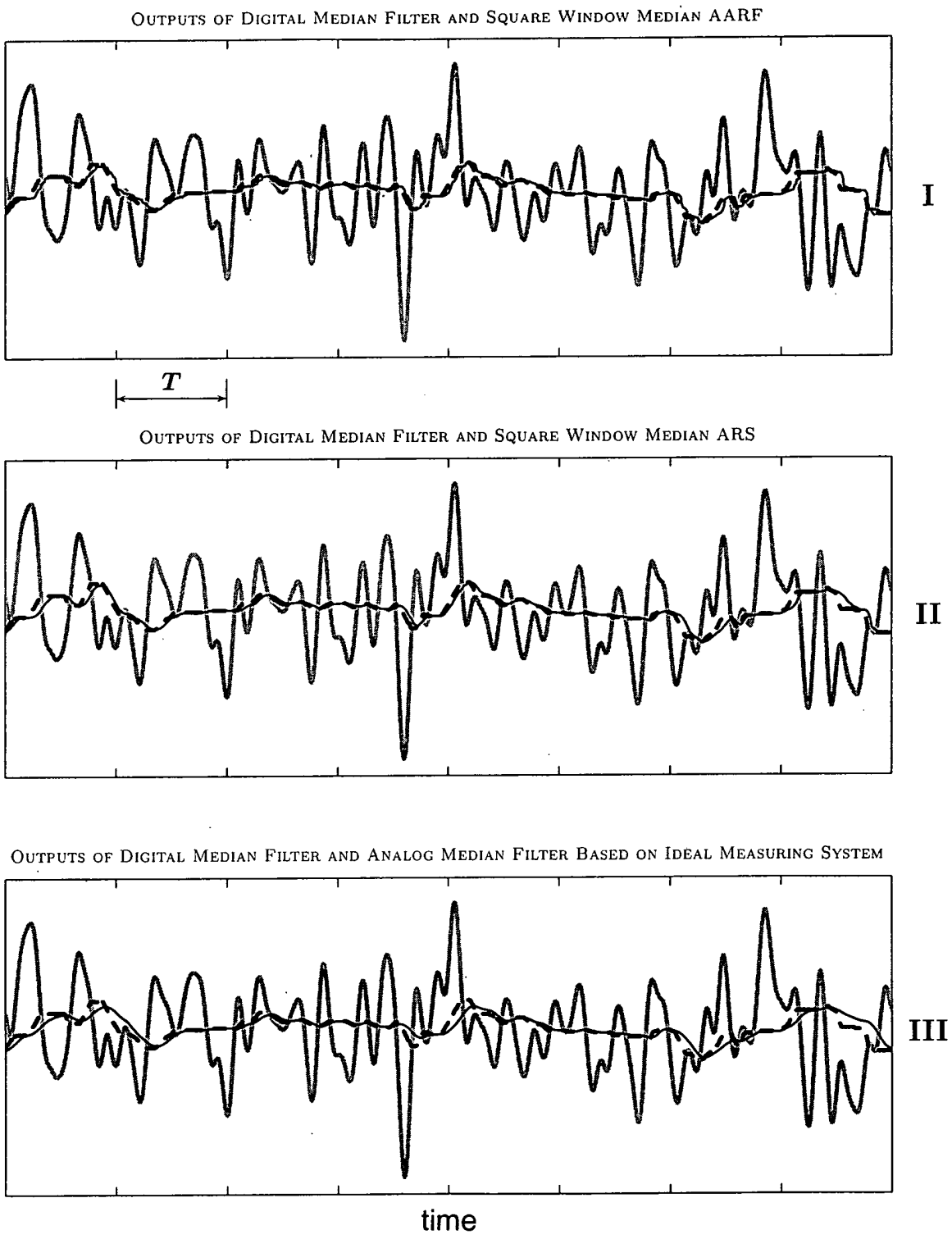

Outputs of Digital Median Filter and Square Window Median AARF
I
T
Outputs of Digital Median Filter and Square Window Median ARS
II
Outputs of Digital Median Filter and Analog Median Filter Based on Ideal Measuring System
III
time

Fig. 59 a

PCT/US2004/038054 03.05.2006

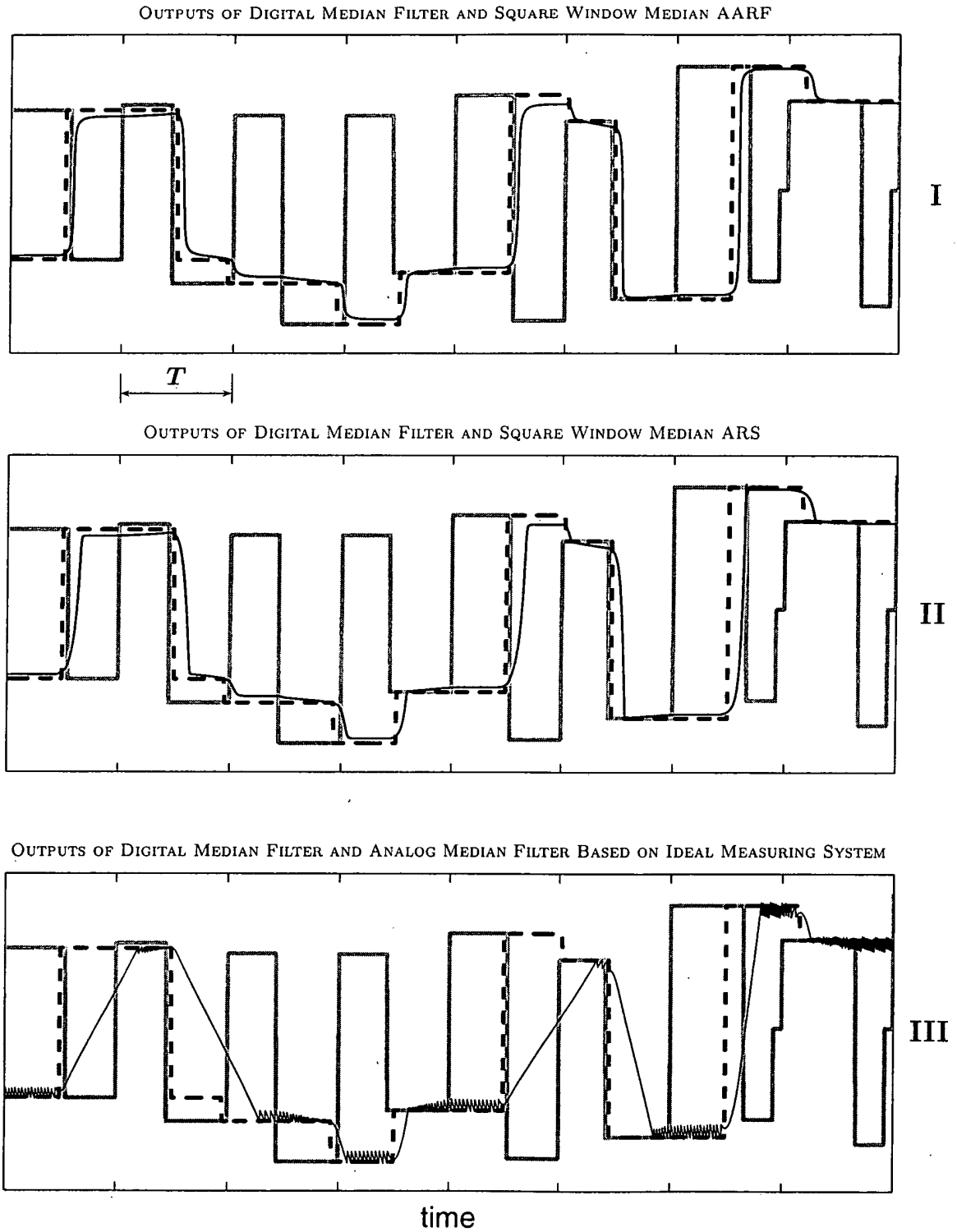
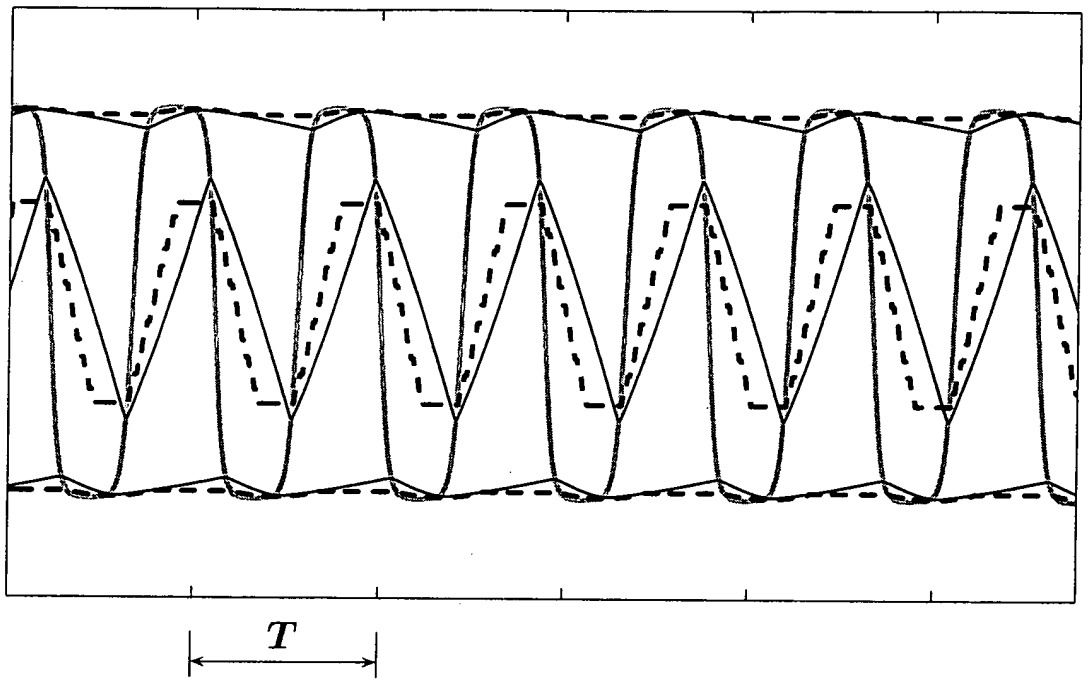



Fig. 59 b

09525454.080301

QUARTILE OUTPUTS OF DIGITAL RANK ORDER FILTER AND $RC_{10}$ AARF




QUARTILE OUTPUTS OF DIGITAL RANK ORDER FILTER AND $RC_{10}$ ARF BASED ON IDEAL MEASURING SYSTEM

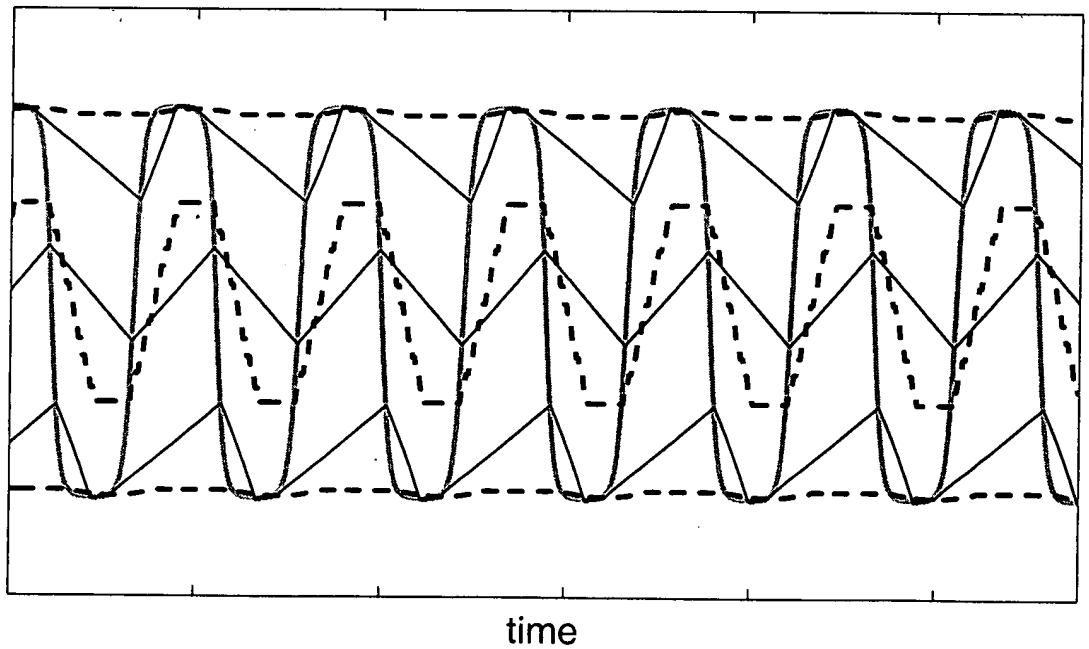



Fig. 60

PROBE-15252.2

TRANSFORMING INPUT VARIABLE INTO MRT VARIABLE

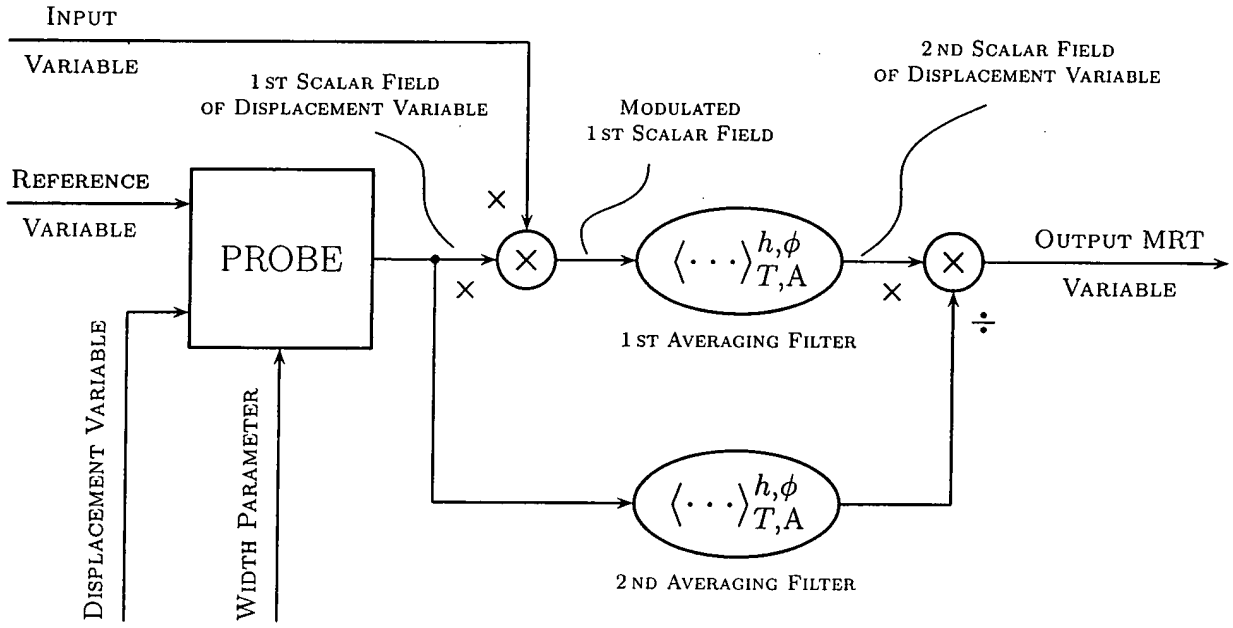



Fig. 61

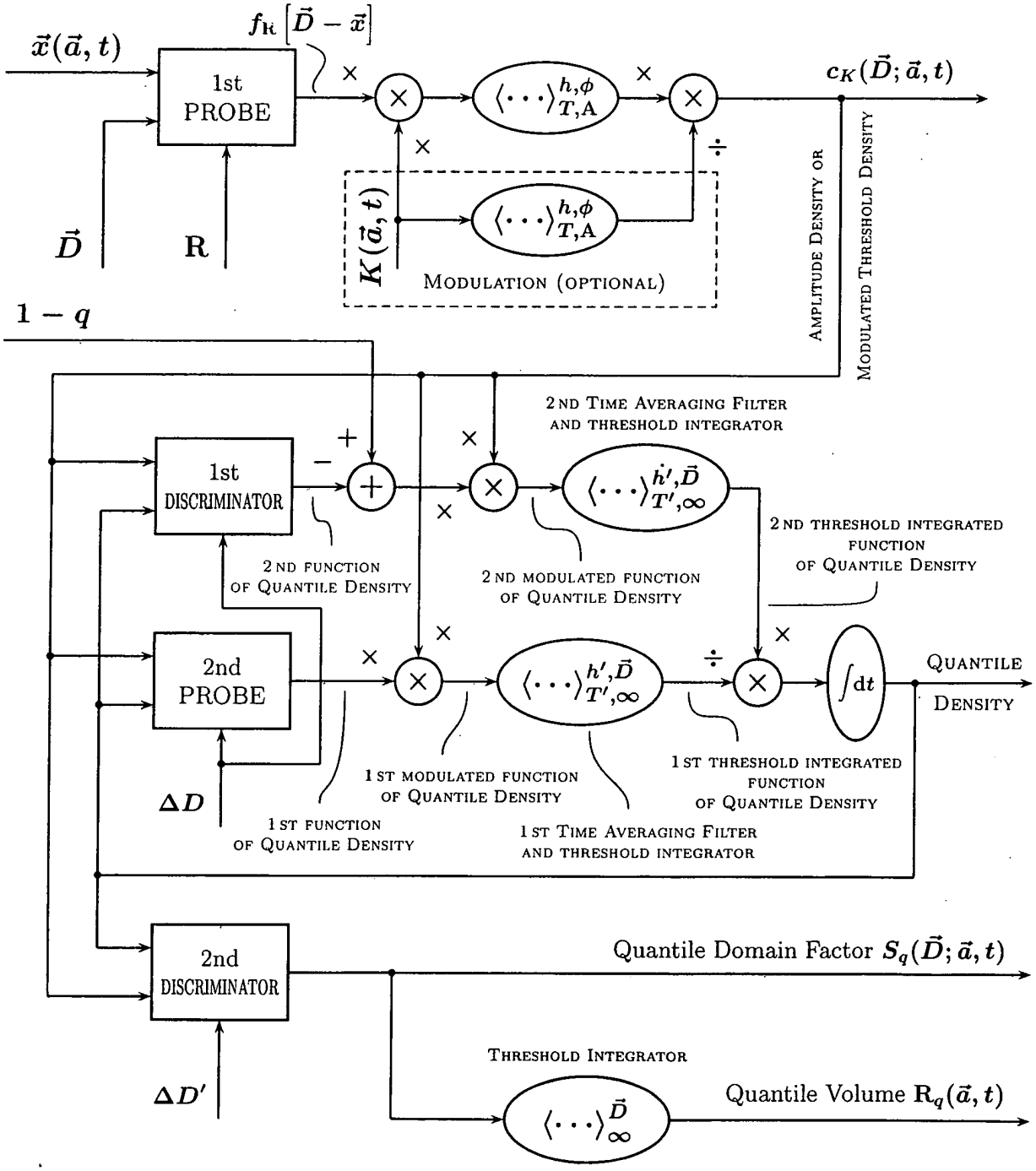

$\vec{x}(\vec{a},t)$
$f_K\left[\vec{D}-\vec{x}\right]$
1st PROBE
$\vec{D}$
R
$\langle\cdots\rangle_{T,A}^{h,\phi}$
$K(\vec{a},t)$
MODULATION (OPTIONAL)
$c_K(\vec{D};\vec{a},t)$
AMPLITUDE DENSITY OR MODULATED THRESHOLD DENSITY
$1-q$
2 ND TIME AVERAGING FILTER AND THRESHOLD INTEGRATOR
1st DISCRIMINATOR
$\langle\cdots\rangle_{T',\infty}^{\dot{h}',\vec{D}}$
2 ND THRESHOLD INTEGRATED FUNCTION OF QUANTILE DENSITY
2 ND FUNCTION OF QUANTILE DENSITY
2 ND MODULATED FUNCTION OF QUANTILE DENSITY
2nd PROBE
$\int dt$
QUANTILE DENSITY
$\Delta D$
1 ST MODULATED FUNCTION OF QUANTILE DENSITY
1 ST THRESHOLD INTEGRATED FUNCTION OF QUANTILE DENSITY
1 ST FUNCTION OF QUANTILE DENSITY
1 ST TIME AVERAGING FILTER AND THRESHOLD INTEGRATOR
2nd DISCRIMINATOR
Quantile Domain Factor $S_q(\vec{D};\vec{a},t)$
$\Delta D'$
THRESHOLD INTEGRATOR
$\langle\cdots\rangle_{\infty}^{\vec{D}}$
Quantile Volume $\mathbf{R}_q(\vec{a},t)$

Fig. 62

EL388608922US

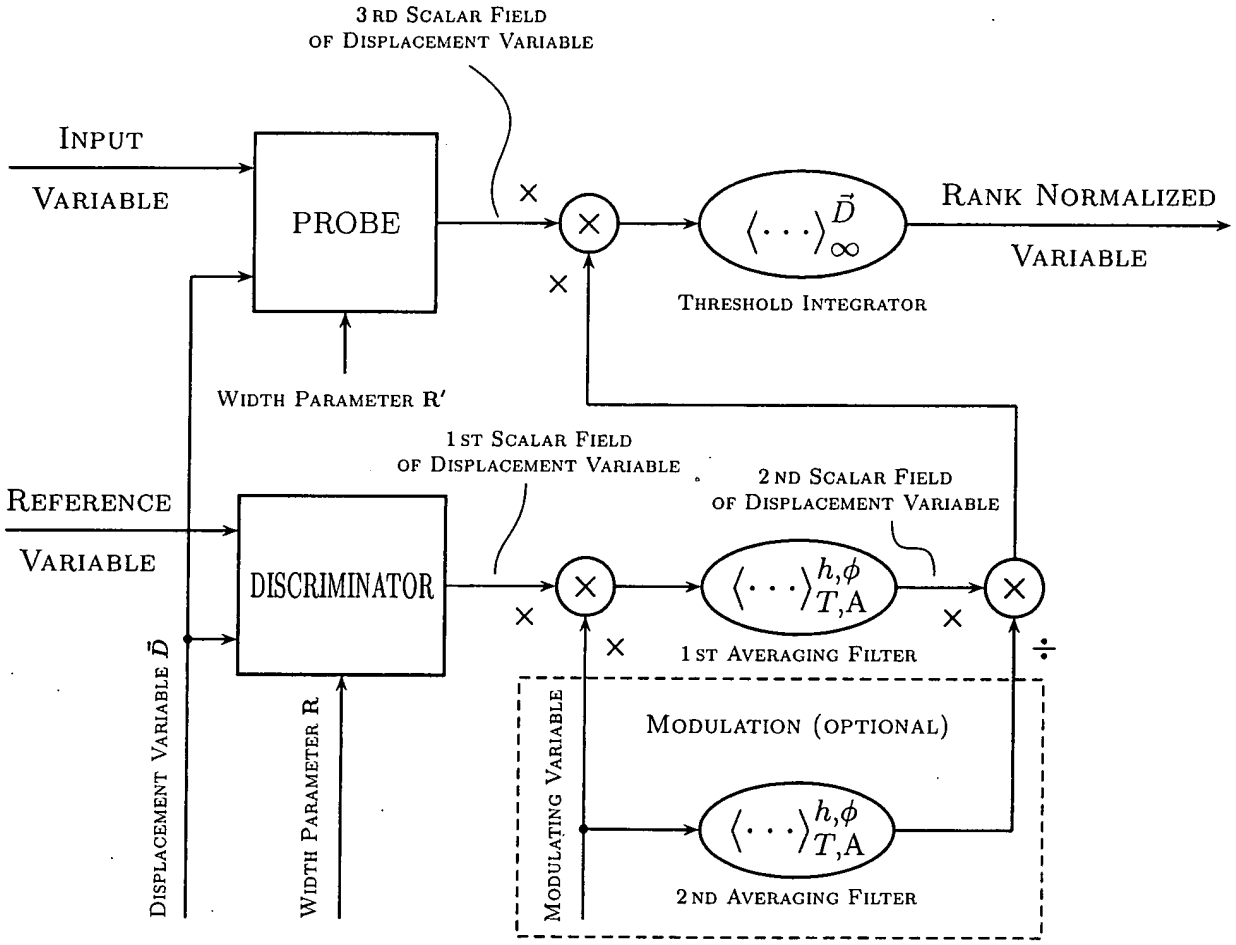



Fig. 63

EL388608922US

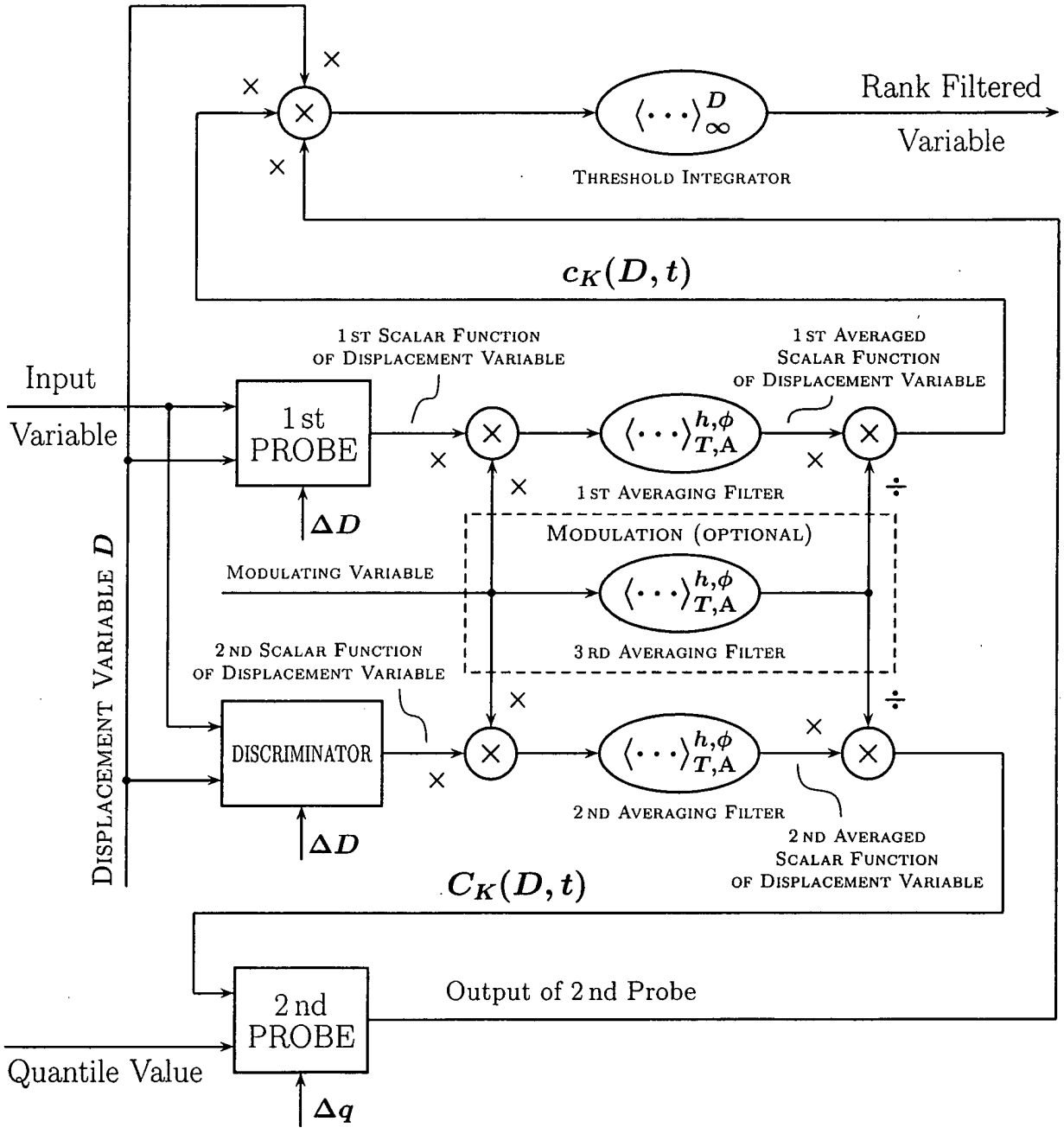



Fig. 64

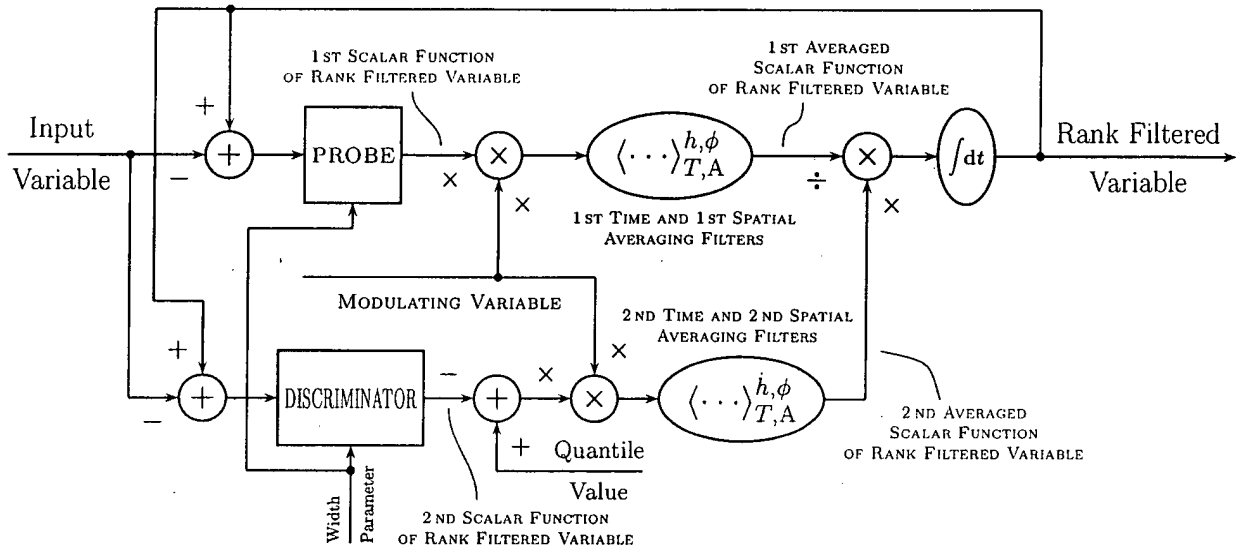

Input
Variable
PROBE
1 ST SCALAR FUNCTION
OF RANK FILTERED VARIABLE
1 ST AVERAGED
SCALAR FUNCTION
OF RANK FILTERED VARIABLE
Rank Filtered
Variable
1 ST TIME AND 1 ST SPATIAL
AVERAGING FILTERS
MODULATING VARIABLE
2 ND TIME AND 2 ND SPATIAL
AVERAGING FILTERS
DISCRIMINATOR
Quantile
Value
2 ND AVERAGED
SCALAR FUNCTION
OF RANK FILTERED VARIABLE
Width
Parameter
2 ND SCALAR FUNCTION
OF RANK FILTERED VARIABLE

Fig. 65

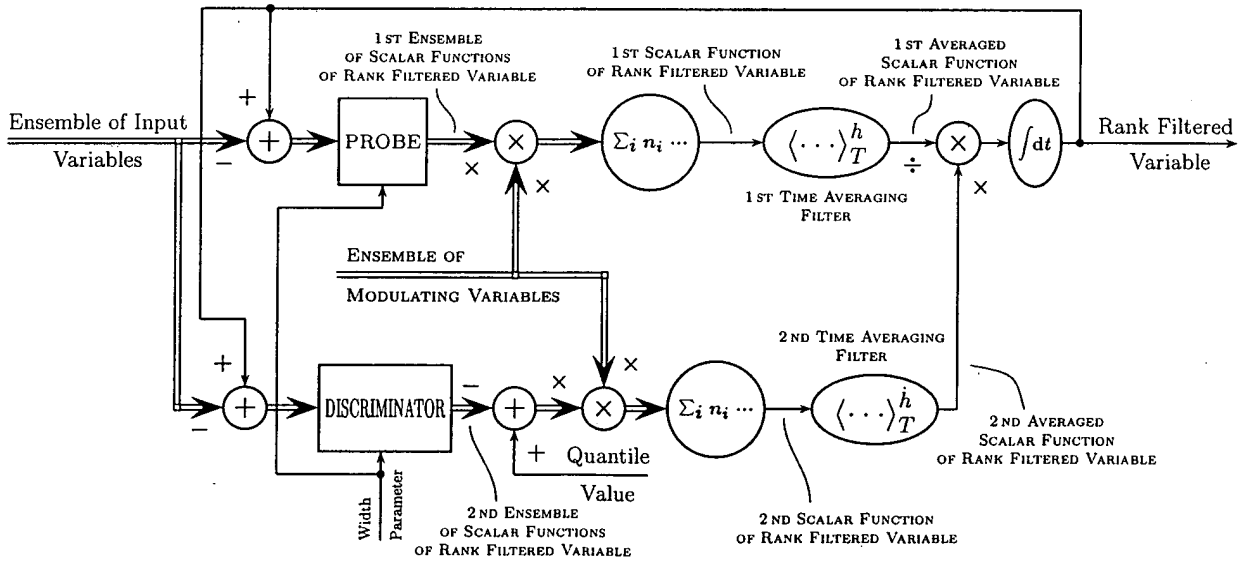

Ensemble of Input
Variables
PROBE
1 ST ENSEMBLE
OF SCALAR FUNCTIONS
OF RANK FILTERED VARIABLE
1 ST SCALAR FUNCTION
OF RANK FILTERED VARIABLE
1 ST AVERAGED
SCALAR FUNCTION
OF RANK FILTERED VARIABLE
Rank Filtered
Variable
1 ST TIME AVERAGING
FILTER
ENSEMBLE OF
MODULATING VARIABLES
2 ND TIME AVERAGING
FILTER
DISCRIMINATOR
Quantile
Value
2 ND AVERAGED
SCALAR FUNCTION
OF RANK FILTERED VARIABLE
Width
Parameter
2 ND ENSEMBLE
OF SCALAR FUNCTIONS
OF RANK FILTERED VARIABLE
2 ND SCALAR FUNCTION
OF RANK FILTERED VARIABLE

Fig. 66